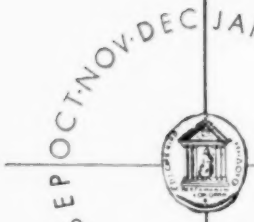

Quarterly Review of OPHTHALMOLOGY

Conrad Berens, M.D.

editor-in-chief

INTERNATIONAL RECORD OF OPHTHALMOLOGY

Abstracts on Military and
Aviation Ophthalmology
and Visual Sciences

Conrad Berens, M.D., F.A.C.S.
and L. Benjamin Sheppard, M.D.

VOLUME 7 NO. 4 DECEMBER 1951

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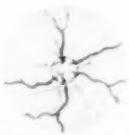

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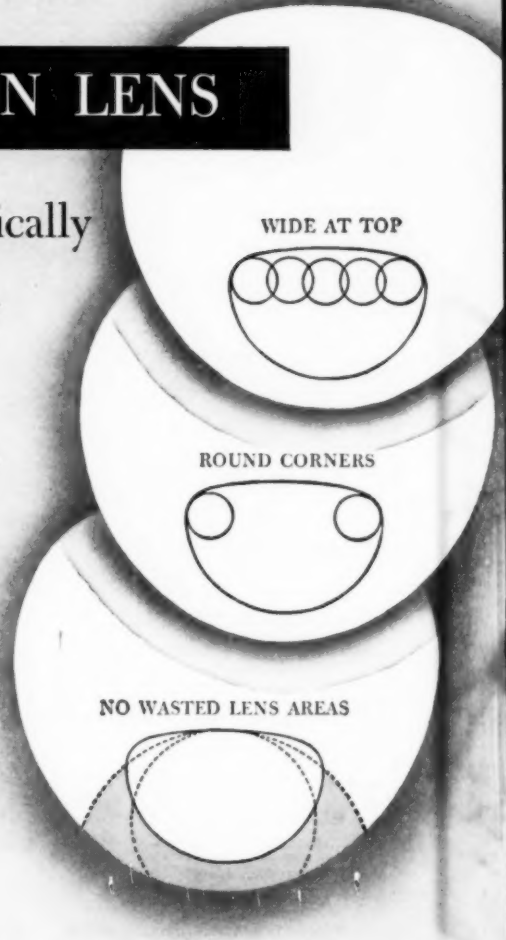

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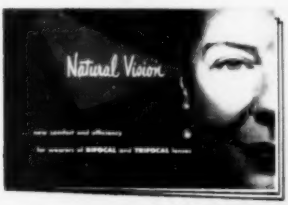

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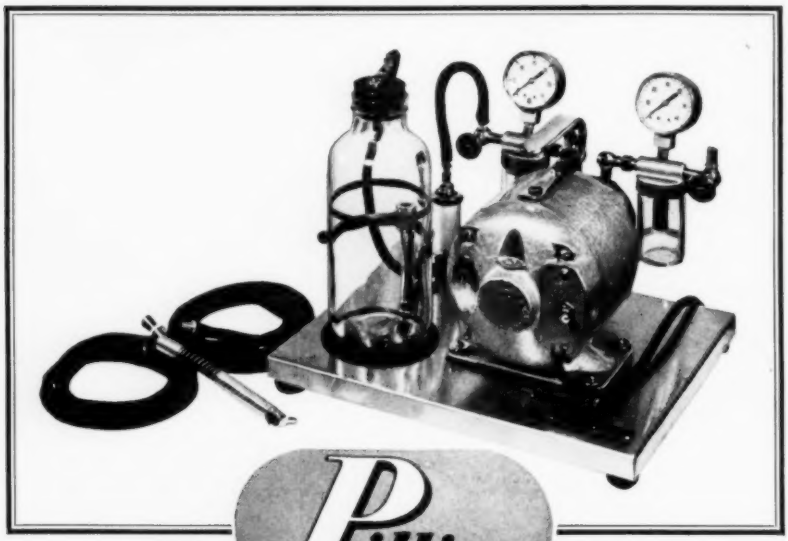

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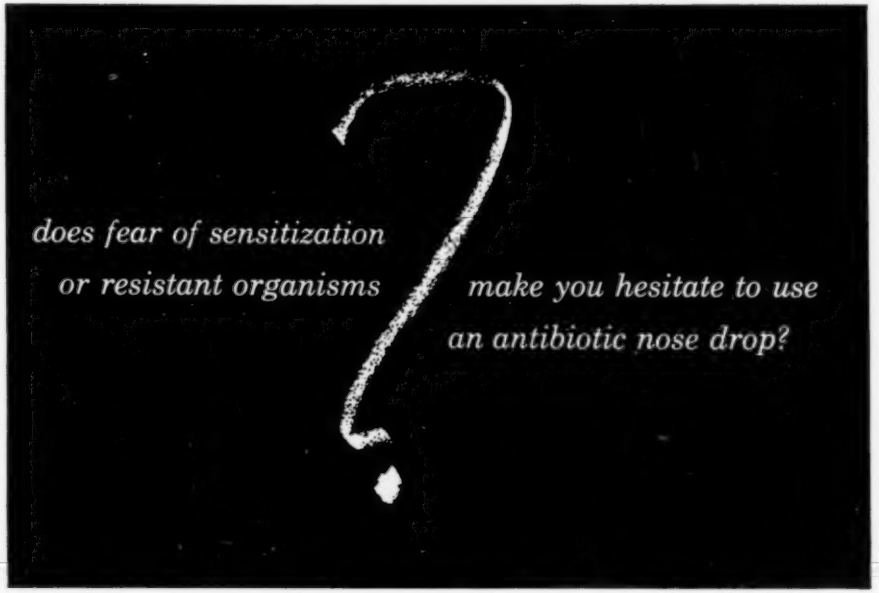

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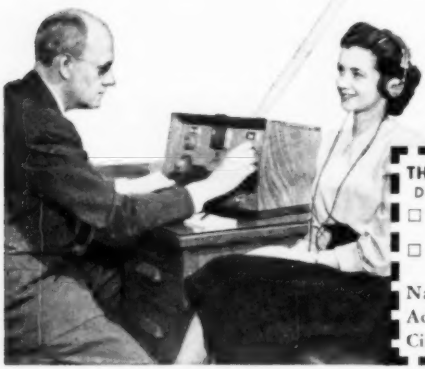

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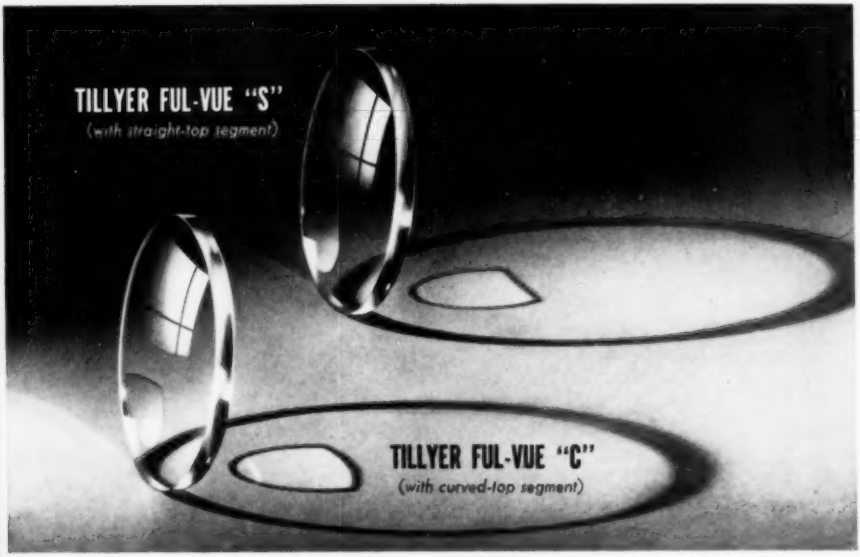

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Abstracts
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Conrad Berens, M.D., F.A.C.S.
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L. Benjamin Sheppard, M.D.

This comprehensive review is being published in the QUARTERLY REVIEW OF OPHTHALMOLOGY, in serial form, the first installment appearing in the March, 1951 issue. For the full scope of the material to be presented in subsequent issues, see the complete table of contents in the March issue.

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XXXI. Decompression

A. HISTORY

302. Boyle, R.: *The spring and weight of the air.* London, H. Hall, 1660.

Boyle observed that, in the eyes and also in the blood vessels of animals which had been subjected to very rapid decompression, bubbles appeared. He suggested that these bubbles formed from particles of air which had been absorbed by the blood stream.

303. Boyle, R.: *New pneumatical experiments about respiration,* Philos. Trans. 5:2011-58, 1670.

Boyle placed many kinds of animals in bell jars from which the air was exhausted and observed bubbles in the aqueous humor of a snake.

304. Boyle, R.: *The works of the Honourable Robert Boyle,* tr. by R. Boulton, vol. II, London, 1700.

A compression and decompression chamber for animals was made earlier than 1677 by Boyle. This volume contained a description of the engine with a double tube to exhaust the air, of the mercurial gauge, and of the engine made to compress air.

Boyle used this chamber for numerous experiments on birds, mice, butterflies, ducks, vipers, frogs, etc. He concluded that air is as necessary to animals as food.

He also reported experiments showing that air unfit for respiration retains its wonted pressure.

305. Junod, V. T.: *Physiologic and therapeutic research on the effects of compression and rarefaction of air, on the body and isolated members (Recherches physiologiques et therapeutiques sur les effets de la compression et de la raréfaction de l'air, tant sur le corps que sur les membres isolés).* Rev. méd. franç. étrang. 3:350, 1834.

Junod made a copper compression and decompression chamber and refers to one experiment performed in this chamber in 1832.

The phenomena of diminished pressure are discussed. No mention is made of the eye.

306. Murray, J.: *Nature and treatment of cholera. New method proposed.* London, M. & S. J. 1:749, 1832.

"In the course of experiments instituted upon respiration I observed that an animal confined in an air tight vessel did not seem to suffer much inconvenience if a proper supply of air was afforded for breathing by a hood adapted to the mouth and nose; while at the same time the air in the vessel was exhausted or rarified by a pump to the extent of two or three pounds to the square inch. After incredible labour and expense I succeeded in procuring a kind of bath, into which a young man was introduced with hood attached, leaving an open space for the eyes, mouth and nose and luting the margin of the opening

around the cheeks and forehead." Air exhausted in glass mercury rose 3 inches. The man was confined for 20 minutes and felt exhilerated.

307. SNELL, E. H.: *Compressed-air illness or so-called caisson disease*, London, 1896.

Snell has reported a number of cases of caisson disease in which vision was affected. In only a few cases were the fundi examined, and those were found to be normal.

Snell tabulated the theories of the etiology of compressed air as follows: (1) those of exhaustion and CO_2 poisoning; (2) those ascribing the diseases to mechanical congestion of the viscera; (3) theories depending on an increased solution by the blood of the gases of the compressed air and liberation of these gases on the removal of the pressure.

See also: No. 95, Clanny, 1835.

B. MISCELLANEOUS INFORMATION

308. ARMSTRONG, H. G.: *Notes from the physiological research laboratory, Wright Field, Dayton, Ohio*, Flight Surg. Top. 1 (No. 3) :73-75, 1937.

The "bends," or caisson disease, may develop at high altitudes, although nitrogen bubbles actually have not yet been discovered in the blood.

309. FULTON, J. F.: *Physiology of aviation and medical preparedness*, Connecticut State M. J. 4:590-94, 1940.

In its acute form airsickness occurs generally in rough weather when there is sudden acceleration in any direction of space, with consequent stimulation of the vestibular system. In certain types of rough weather, even the most hardened pilots become ill, but with any given individual the predisposition to airsickness varies with physiologic states of fatigue, emotional status, overindulgence, especially of alcohol (the morning after).

Diminished partial pressure of oxygen experienced in altitudes above 5,000 feet leads to physical inertia.

When breathing pure oxygen from a mask, a pilot may ascend to 25,000 or 35,000 feet without experiencing symptoms referable to oxygen want.

The same phenomenon, known as bends or caisson sickness, occurs in aviators when they subject themselves to a sudden change from atmospheric pressure to an altitude of 30,000 feet, i.e., when they become decompressed from one atmosphere to a third of an atmosphere.

During "black-out," vision and hearing are abolished, and consciousness may be lost for periods varying from a few seconds to several minutes, depending on the velocity and the sharpness of the turn of the airplane.

C. OCULAR DISTURBANCES

310. BARRAT AND BASTIAN: *Concerning ocular disturbances encountered among workmen in submarine caissons (a propos d'une affection oculaire rencontrée chez des ouvriers travaillant dans des caissons sousmarins)*, Arch. de méd. et pharm. nav. 126:270-305, 1936.

Barrat and Bastian presented 9 cases demonstrating ocular disturbances in workmen in caissons.

311. Bassoe, P.: *Compressed air disease*, J. Nerv. & Ment. Dis. 38:368-69, 1911.

Bassoe tabulated the history and examination of 161 affected caisson workers. The findings were as follows: 89 had various affections of the ears causing permanent impairment of hearing in 65 cases; 141 gave a history of bends, that is, severe muscular and articular pains; 34 had paralysis, most generally transient and affecting the one arm and both legs; 11 presented more or less chronic joint pain and stiffness; 33 complained of vertigo; 6 had blind staggers, that is, labyrinthine vertigo with nystagmus.

Cases treated by immediate "recompression" fared much better than those not so treated.

Aside from the nystagmus connected with "blind staggers," no eye symptoms occurred in Bassoe's cases.

Allport in 1908 described a case of total blindness from hemorrhagic effusions in the choroid, retina, and vitreous.

Cornell described a case in which supra-orbital pain occurred. This he ascribed to retention of compressed air in the frontal sinuses.

312. Bucalossi, A.: *A study of ocular tension in normal individuals under influence of modified decompression* (*Comportamento del tono oculare in individui normali sotto l'influenza della decompressione ambiente*), Ann. di ottal. e clin. ocul. 66:292-312, 1938.

The article opened with a review of literature (no English) on ocular tension under modifications of atmospheric pressure. The author experimented with 12 young men, aged 18 to 24 years, in perfect physical and ocular condition. All were inhabitants of low country and only one had flown, that one not over 3,000 miles. None had ever been in a pneumatic chamber. Tests consisted of two successive decompressions under fixed rates of decompression and recompression, and fixed period of maintenance of constant decompression; second series of tests increased the rates of decompression and recompression with longer period of maintenance of constant decompression.

From his results he drew the following conclusions:

(1) Maximal and minimal arterial pressure increases during production of decompression, then progressively decreases during the period of maintenance of decreased pressure and during recompression. At the end of the test, with normal atmospheric pressure, there remains a slight degree of hypertension of blood pressure.

(2) The ocular tension increases during decompression, descends again to initial values during period of maintenance of decreased pressure, and shows no marked change during recompression.

(3) In equality with the velocity of decompression, the increase in arterial pressure and ocular tension during the decompressive stage is generally higher, the higher the degree of decompression obtained.

(4) In equality with the degree of decompression, the increase in arterial pressure and ocular tone during the production of decompression is generally the higher the more rapidly the latter is obtained.

(5) Under equal experimental conditions, the modifications of arterial pressure and ocular tone with relation to the diminution of the surrounding atmospheric pressure are of different degrees in different subjects.

The author considered that his experimental conditions were equal to those of actual experience, namely, decompression of relatively moderate degree, realized with moderate rapidity. In test 1, barometric pressure reached was 490 mm. Hg; velocity of decompression, 13.5 mm. Hg per minute; maintained period, 15 minutes; velocity of recompression, 10.8 mm. Hg per minute.

In test 2, barometric pressure reached 435 mm. Hg; rate of decompression, 13.5 mm. Hg; period maintained, 15′; rate of recompression, 10.8 mm. Hg.

In test 3, barometric pressure reached 460 mm. Hg; rate of decompression, 13.6 mm. Hg; period maintained, 20′; rate of recompression, 12 mm. Hg.

In test 4, barometric pressure reached 460 mm. Hg; rate of decompression, 16.6 mm. Hg; period maintained, 20′; rate of recompression, 13.6 mm. Hg.

313. Callan, L. W.: *Double choked disks associated with compressed air disease (caisson disease)*, Arch. Ophth. 36:509-12, 1907.

Callan described a case of double-choked disks associated with compressed-air disease (caisson disease). This patient's vision became distorted, and diplopia was present one month after the first symptoms of caisson disease. Vision was right eye 20/100 and left eye 20/100.

His eye symptoms included slight convergent strabismus of the left eye which was not constant. His pupils reacted sluggishly to light and accommodation. Ophthalmoscopic examination showed marked choked disks with a few striated hemorrhages on the nerves and in the region of the macula.

The treatment included: rest, potassium iodide, saturated solution, ten drops three times daily, increasing drops two each dose, and inunctions of Hg (mercury) 3½ three times daily.

The patient had 20/30 vision right eye and 20/40 vision left eye when last observed and the choking of the nerves was decreasing very slowly.

Pol and Watelle (1907) gave as one of the accidents following decompression, permanent blindness.

Thomas Oliver (London) reported a number of cases in which the patients complained of a contracted field of vision and some defective central vision. In a few of these the fundi were examined and found normal.

314. Genet, M. L.: *Partial optic atrophy and caisson disease (Atrophie optique partielle et maladies des caissons)*, Bull. Soc. d'opht. de Paris 45:318-21, 1933.

Genet described a case of partial optic nerve atrophy and caisson disease. The visual disturbance in this case was found at the same time as the aural trouble, the cerebral symptoms, and the pains in the knee.

315. Ginestous and Cruchet: *Subconjunctival ecchymosis in a diver*, Gaz. hebd. d. se. méd. de Bordeaux, 42:44, 1921.

The case history of a professional diver, age 27 years, who had been in the trade for

eight years, is described. Hereditary and personal antecedents were without note. He had never had a hemorrhage of any sort since diving. However, two years previously perforation of the tympanum followed a dive. The patient made a dive of 2 m. depth and was barely in the water when he felt rather violent pain in his left eye. When he came up and removed his diving suit, the eye was infected, and the next morning there was a hemorrhage in this eye.

Examination showed ecchymosis of the entire lower part of the bulbar conjunctiva of the left eye, but no other lesion. Visual acuity of 10/10 was present, and with the ophthalmoscope the fundus, papilla, and macula were normal.

Examination of the heart revealed: large heart with tip descending to the sixth rib; slight murmur at the extreme tip during the first stage systolic, coming under the murmur called asthenic of Lamacq. In other words the patient showed a cardiovascular asthenia.

316. GOTTEN, N.: *Neurological manifestations of caisson disease*, Memphis M. J. 14:79-80, 1939.

Gotten presented 7 cases of neurologic manifestations ranging from blindness to complete paralysis of the lower extremities. He also stresses the fact that it is extremely difficult to determine at times whether the condition is due to air pressure, is hysterical or psychic, or whether the patient is a malingerer.

317. HENDERSON, R. D.: *Caisson's disease — "Bends" — Diver's paralysis*, Flight Surg. Top. 3:187, 1939.

All the manifestations can be traced back to the liberation of bubbles of nitrogen in the blood vessels or tissues of the body, and the symptoms depend chiefly on the size and location of the bubbles.

In the cases described, one complained of spots before his eyes; another case had eight diopters of choking in the right eye and four in the left, and there was a loss of associated ocular movements.

318. KEAYS, F. L.: *Compressed air illness*, Ann. Labor Legisl. Rev. 2:192-205, 1912.

Keays described the etiology, symptoms, pathology, and treatmeant of compressed-air illness. Recompression is recommended as the most efficient means of treatment.

The author reported cases of sensory disturbance, sensory and motor disturbance, and cases showing vertigo and "staggers."

319. PFLIMLIN, R.: *Caisson Disease—Ocular involvement with special reference to the formation of cataract (Beteiligung des Auges bei der Caissonkrankheit, insbesondere Katarakthildung)*, Klin. Monatsbl. f. Augenh. 92:54-58, 1934.

Pflimlin described a case of caisson disease in which ocular involvement occurred.

The case was that of a 38-year-old caisson worker who had worked in a caisson for only a relatively short time but as a result contracted a likely central visual pathway defect in which bilateral cataract appeared. The changes in the visual pathways were probably

localized to the visual cortex. The recovery from it undoubtedly points to caisson myelitis.

It seems to Pflimlin that, because of the relation of the lens to the surrounding aqueous humor of the eye, it lies within the range of possibility that by working in a caisson an increased nitrogen absorption can change the nitrogen content of the lens, thereby changing it to gas bubbles in the lens upon return to normal air pressure.

It is possible that the lens should sometimes be affected because in caisson disease damage is observed in almost every organ.

320. SHILLING, C. W.: *Compressed-air illness,* U. S. Nav. M. Bull. 36:9-17, 235-59, 1938.

Shilling has presented an impartial review of all the available literature on compressed-air illness. The study has been divided into: history, cause, symptoms, treatment, prognosis, prophylaxis, and general bibliography. He states that involvement of the eyes is relatively uncommon but diplopia, nystagmus, and transient blindness have been reported.

321. SHILLING, C. W.; HAWKINS, J. A.; POLAK, I. B., AND HANSEN, R. A.: *Caisson disease and its relation to tissue saturation with nitrogen,* U. S. Nav. M. Bull. 33:434-44, 1935.

Forty-six cases of caisson disease, occurring during 2,143 experimental dives, are presented. Thirteen cases occurred following exposures of from 34 to 53½ minutes at a depth of 100 feet (gage). Twenty-two cases occurred following exposures of from 18½ to 28 minutes at a depth of 150 feet (gage). Six cases occurred following exposures of from 17½ to 22½ minutes at 167 feet (gage). Three cases occurred following exposures of 12½ to 13½ minutes at 185 feet (gage). Two cases occurred following 13- and 14-minute exposures, respectively, at 200 feet (gage).

It has been shown that the nitrogen saturation of the theoretical tissues is definitely related to the incidence of caisson disease.

In the cases described the following eye symptoms were noted: (1) left pupil almost pear-shaped, right somewhat irregular but less so than the left; (2) loss of visual acuity; (3) "lightning streaks about the eyes."

322. SILLEVAERTS: *Note on the special pathology of the aviator (Note sur la pathologie spécial de l'aviateur),* Arch. méd. belges, 89:26, 1936. Abstract: J. Aviation Med. 7:143, 1936.

The slow type of decompression disease may be associated with tachycardia, increased maxima and diminished minima, hypacusia, tinnitus, diminution of visual acuity, frontal headache, torpor, fatigue, a tendency to syncope and somnolence coming on suddenly and with fatal results unless recompression saves the pilot.

In the acute type the above symptoms come on rapidlly.

Contributing causes to airsickness include the atmosphere of the cabin, optic vertigo, faulty ventilation, and momentary condition of the pilot.

Pilots are exhausted at 40 years of age and should not be admitted to the service or retained after this age.

D. THERAPEUTICS

See: therapeutics—decompression.

XXXII. Deceleration

See: acceleration—deceleration.

XXXIII. Depth Perception

A. ACCIDENTS

323. PASTORE, F.: *The importance of each ocular function in regard to medico-legal evaluation in the selection and control of aviators (L'importanza di alcune funzioni oculari in rapporto al giudizio medico-legale per l'arruolamento ed il controllo degli aviatori)*, Florence, G. Spinelli e C., 1927, 36 pp.

In the introduction to the author's paper on perception of depth read before the IV Congresso Internazionale di Navigazione Aerea, Roma, he stated that in this paper he "noted that exceptional importance during flight and particularly in landing of depth perception or appreciation of distance." He reported an English inquest on flying accidents, that they were in large measure due to errors in judgment of distance of the ground. He made a clear distinction between a sense of relief which is a visual sensation, and depth perception, which is a visual judgment. He examined the basic factors, namely, convergence, accommodation, binocular parallax, greater or less precision, and greater or less luminosity of the retinal image. The sensation of convergence and accommodation may be considered in appreciation of distance only when nearby. Therefore, ocular measure in general and appreciation of depth in particular are given principally, says Howard, by binocular parallax and by the size of the retinal image. He then presented the conclusions of Howard and of Deyo.

See also: accidents—depth perception.

B. AGE

324. BROUWER, J. E. AND JONGBLOED, J.: *Changes in binocular depth perception in older fliers (Die veränderung des binokularen Tiefensehens bei älteren Fliegern)*, Mil. geneesk. tijdschr. 29:64, 1940. Abstract: Deutsche Mil.-ärztl. 5:503, 1940.

In more than 50 subjects with normal visual acuity, normal muscular balance (ocular), and normal binocular depth perception, the course of accuracy of binocular depth perception was studied with the so-called three-rod apparatus. This study was pursued for a period of 10 to 20 years (from the twentieth to the forty-fifth year of life). Even though the accuracy remained within normal limits in all of the subjects, there was a slight diminution in three quarters of the cases. Simultaneous diminution of visual acuity or balance of ocular muscles could not be determined. Apparently there was a reduction in psychic concentration on the method of examination.

See also: age, effect of, on the eye—depth perception.

C. ALTITUDE

325. Satô, H. and Obonai, T.: *The records of discriminating the differences of heights of objects on the surface of the earth viewed from a flying airplane.* Jap. J. Psychol. 11:481-88, 1936.

"On the 26th of December, 1935, I (Satô) tried to rise up to a height of about 3,000 m. over Haneda Aerodrome in a training machine of the Mongs III type and to discriminate the difference of heights of objects. It was glorious weather.

When my airplane, in ascending, had just come to the point where it was no longer possible to distinguish the difference of heights of objects, its altitudes were as follows (the horizontal distance between the two respective objects was within 10 m.): (1) surface of a lawn and airplane flying above it (3-4 m. high), 150 m.; (2) an iron pipe (about 10 m. high) and cottage (5 m. high), 200 m.; (3) the ground and electric wires over it, 150-300 m.; (4) a pine tree (10 m. high) and a lodge (4 m. high), 300 m.; (5) difference between heights of roofs of ordinary houses, 700 m.; (6) surface of sea or lawn and an airplane flying at altitude of 150 to 200 m., 750 m.; (7) difference between roof (10 m. high) and chimney of factory), 850 m.; (8) surface of aerodrome and aeroplane flying at altitude of over 200 m., 1,100 m.; (9) the ground and various flying aeroplanes, 1,300 m.; (10) the heights of the hills near Ohmori, 1,800 m.; (11) ground and gas-tank (40 m. high) near coast of Omori, 2,200 m.

Since the records indicating altitude of over 1,000 meters are not exact, they should be tested once more by a series of experiments at some future time. It will be necessary to take various weather conditions into consideration, and to make experiments with a subject who is ignorant of the sizes of the landmarks!"

See also: altitude-anoxia—depth perception.

See also: No. *1209*, Wilmer, 1919.

D. ANISEIKONIA

See: aniseikonia.

E. ANISOMETROPIA

326. Borges Dias, A.: *The importance of stereoscopic vision in aviation (A importancia da visão stereoscopica em aviação)*, Rev. brasil. de Cir. 7:13-18, 1938.

After stating that stereoscopic vision is of the greatest importance in an aviator, the author goes into the physics of the eye and gives formulas for focus, refraction, etc. He discussed and defined various anomalies of vision: myopia, hypermetropia, astigmatism, giving formulas for the defect, and other formulas for corrections by lenses. Any and all anomalies of refraction cause poor stereoscopic vision, and, therefore, careful investigation of defects of refraction must be made. The author used the stereoscope of Carl Zeiss for examinations of stereoscopic vision.

327. Joffe, Z.: *Stereoscopic vision in anisometropia*, Vestnik oftal. 3:423, 1937.

This study was done on 80 eyes because of anisometropia and on 10 eyes with opacities

of the cornea in youths 14 to 18 years old with the author's stereomyography. The results were as follows:

1. Poor stereoscopic vision was observed in 11 per cent for near and in 25 per cent for distance.

2. Stereoscopic vision depends completely on the visual acuity and its difference between the two eyes. If the vision is 1.00 in one eye and 0.4 or below in the other, the stereoscopic vision is not stable and is lowered for distance.

3. The degree of anisometropia and refraction do not influence the stereoscopic vision.

4. In professional selection only the difference of the vision between the two eyes should be considered.

5. The examination for stereoscopic vision should be included for the vocational selection of the candidates in the general eye examination.—Olga Sitchevska, M.D.

F. LANDING

See: landing.
See also: No. 868, Rippon, 1927.

G. MISCELLANEOUS INFORMATION ON DEPTH PERCEPTION

328. BARD, L.: *The existence of analytic elements of distances in the visual, acoustic and gyratory sensory images* (*De l'existence d'elements analytiques des distances dans les images sensorielles visuelles, acoustiques et gyratoires*), J. de Physiol. et de path. gén. 18:295-304, 1919-20.

The author discussed the bases for the sense of distance in the gyratory sense (situated in utriculus vestibuli and sacculus communis of labyrinth of ear) as a combination of recognition of axis of gyration with that of form of trajectory.

With respect to the sense of distance in vision, the author pointed out that relief of near objects is much more clear than for far objects, but as the object recedes there is a simultaneous and proportionate lessening of all dimensions. He found no reason for thinking the perception of width and height are spontaneous and autonomous, while depth is the result of complex or intellectual operations. The same is true of perception of the three dimensions in the lateral fields of vision.

Attribution of the idea of relief to binocular vision is not exact, as it is possible with a single eye. In reality, the perception of relief is due to the qualities of the optic image; it has the same three dimensions as the object from which it comes. The retina of the eye is not a flat plane of two dimensions, as supposed, but a receptive layer of 50 to 60 mμ in height, through which the optic image can be spread out according to its spatial coordinates. The superficial layers are absolutely transparent, while the deep layer, strongly pigmented, absorbs the rays without reflecting them.

The focus of the crystalline lens also is not a mathematical plane but fuses only the rays originating from the same starting point. It concentrates the lines and successive plane of vast space in a very small space, but the reproduction is exact of the original. All the distance in the original is found in the image.

329. IOFE, TS.: *Physiologic standards of acuity of depth perception in adolescents with normal vision.* Sovet. vestnik oftal. 8:142-49, 1936.

The author stated that after having learned how to use the Litinsky stereomyograph, he set about determining physiologic norms for acuity of depth perception and muscular balance in adolescent emmetropes with visual acuity of one. He examined a group of 106 boys from 13 to 18 years, having average intelligence, and then made the same examinations with a group of Voroshilovsk riflemen attending a sniper's school, in the age-group from 23 to 32 years, for the purpose of checking the age factor. In table I, findings in the 106 boys from 13 to 18 years old, averages were: interpupillary distance, 60.5; acuity of depth perception in vertical position $\frac{90.1}{87.6}$ per cent, in horizontal position $\frac{83.1}{80.0}$ per cent, the denominators representing near distance.

In table II, findings in 60 men from 23 to 32, average interpupillary distance was 63.3, acuity of depth perception for vertical position $\frac{92.3}{89.7}$ per cent and for horizontal position $\frac{88.9}{84.8}$ per cent.

Table III gives muscle balance for the adolescents: averages are orthophoria near and far 46.2 per cent; exophoria near and far—5.6; exophoria near and orthophoria far—45.2; esophoria* near and far—2.7.

330. PASTORE, F.: *Depth perception and its factors (La percezione della profondita e suoi fattori).* Florence, G. Spinelli e compagniz, 1927, 17 pp. Also: IV. Congr. internaz. di navigazione aerea, Rome, Oct. 24-30, 1927; 4:608-23, 1928.

The author conducted experiments on 29 aspirants for pilot training, 7 pilots in service and 14 pilots in reserve, using Palmer's apparatus. The graph of results shows the lines of monocular perception very close together and that of binocular perception of depth almost parallel for 9/10 of the course. The differences, relatively small, may be said to be physical, because visual acuity and judgment are more precise in binocular vision. Judgment of distances of objects is based on comparison of successive retinal images, either of different size or different location, and this comparison is more exact with simultaneous images in both eyes than when made from memory of monocular images. The average binocular error was 7.87 mm. with 6.2″, while the average binocular error was 11.40 mm. with 8.9″. The author considered that the small difference in these errors authorizes giving equal importance to size of the retinal image and to binocular parallax of movement.

The author concluded that perception of depth is not due to the sense of vision alone but is based on a complex of sensations, some visual and others kinetic. Vision at a distance (as he concluded in his other paper) is based on two main factors, namely on the retinal sensation and on the sense of the bulbomuscular innervation.

The author noted that there was greater error in perception of depth in ametropic eyes, due to inequality of the retinal image, and the smallest error was found in those with the greatest distance between pupils, thus giving greater parallax.

*Russian word: Azoforiya—probably intended for esophoria.

During tests, ametropic eyes made fewer errors than emmetropes due to better attention.

331. THORNE, F. H.: *Review of depth perception*, Mil. Surgeon 63:643-57, 1928.

The factors composing the basic group constitute a part of the physical functions of the individual; they are constant and, when considered together, may be termed his "inherent ability" to judge distance. These factors consist of: (1) physiologic diplopia; (2) accommodation; (3) convergence; (4) binocular parallax. The factors composing the adjunctive group may function independently of the individual; they are inconstant and are common to all persons. They may be termed as factors which assist or enhance the basic group. These factors consist of: (1) size of the retinal image; (2) motion parallax (movements of head or object); (3) terrestrial association: (a) linear perspective, (b) overlapping of contours and (c) light, reflections, and shadows; (4) aerial perspective, i.e., the changes with respect to color, brightness, and contrast which different objects undergo on account of variations in the clarity of the intervening atmosphere.

Some of the factors operating to constitute depth perception are common to monocular and binocular single vision alike, while others pertain to binocular single vision only. The factors common to monocular and binocular single vision are: (1) the size of the retinal image; (2) accommodation; (3) motion parallax; (4) terrestrial association; (5) aerial perspective.

The factors which operate with binocular single vision only are: (1) physiologic diplopia; (2) binocular parallax; (3) convergence.

If in the first series of trials the candidate makes an average error of over 25 mm., i.e., between 26 and 50 and no ocular or general physical defect can be found to account for it, it is advisable to recheck him every day for at least three days. Invariably these candidates will eventually attain an average error of 25 mm. or less. Experience has taught us that these individuals experience no difficulty in flying in so far as judgment of distances is concerned.

See also: No. *508*, Dudley, 1919; No. *718*, Halben, 1914; No. *799*, Anderson, 1919; No. *928*, Anderson, 1940; No. *964*, Schwichtenberg, 1939; No. *1047*, Ziegler, 1936-39; No. *1128*, Strong, 1939; No. *1212*, Berger, 1917; No. *1222*, Munro, 1923.

II. MONOCULAR AND BINOCULAR CLUES

332. DEYO, B. V.: *Monocular and binocular judgment of distance*, Am. J. Ophth., 5:343-47, 1922. Also Air Ser. Inform. Circ. 4 (No. *359*): 28-30, 1922.

The subjects for the examination were given the standard examination for flying and were rated qualified or disqualified on the findings of the examiner.

For measuring visual acuity the regulation Snellen test charts were used. To qualify on this test the subject must have a visual acuity of 20/20 for each eye. The instrument with which the judgments of depth perception are made is known as the depth perception apparatus. It may be described as the front, back and floor of a rectangular box, the sides and top of which are open. The floor is $21\frac{3}{4}$ inches from front to back and $13\frac{1}{4}$ inches wide, and the height of the back and front is $11\frac{1}{2}$ inches. A window is cut in the front whose lower margin is 4 inches from the floor and whose outer margin is $2\frac{3}{4}$ inches from the side of the apparatus. The entire apparatus is painted a dull black, and the anterior surface of the black covered with a square of dead white cardboard.

Accommodation and convergence can also be eliminated. Howard in an article entitled "A test for the judgment of distance" (No. 513) says: "the two remaining factors are the binocular parallax and the size of the retinal image. It is possible to obtain the relative values of these two factors by using the same test apparatus, first with two eyes and then with only one eye. In the first instance both factors may operate together; in the second instance, the binocular parallax is eliminated, and only the size of the retinal image can operate. This latter is practically as important a factor with one eye as it is with two. If by comparison it be found on the one hand that the results are the same or approximately the same, it is obvious that the size of the retinal image, which operated in both tests, is the important factor. If, on the other hand, it be found that the binocular test produces a far more delicate discrimination than the monocular, we are forced to the conclusion that the binocular parallax is the more important factor, and the size of the retinal image is negligible or practically so."

The depth perception averages (D.P.) of all subjects were found to be as follows:

100 Cases	*M (DP)*	*PEm.*	*Sigma*	*C*
Right eye	118.30	±3.92	58.18	.48
Left eye	118.50	±4.55	67.42	.47
Both eyes	18.65	±1.57	23.23	1.24
Sighting eye (right, 71 cases; left, 29 cases)	110.52	±4.19	62.12	.56

The probable error of the mean (PEm) gives the measure of unreliability of the mean and may be defined as that variation from the average which is as often exceeded as fallen short of. Sigma is likewise a measure of variability. From a survey of these results it is plain, then, that in spite of the wide individual variations in judgment made with binocular vision, the average is far below that made with monocular vision.

The data were next rearranged according to the degree of visual acuity of the subjects.

		Cases	*M (DP)*	*PEm*	*M Dif*	*PEd*	*C*
Right eye	20/20	29	129.68	± 7.91	27.34	— 6.33	.48
	20/15	60	102.34	± 4.74			.53
Left eye	20/20	18	151.94	±13.70	40.12	—12.78	.55
	20/15	64	111.82	± 4.93			.52
Both eyes	20/20	16	28.11	± 1.96	16.09	— 1.74	.64
	20/15	57	12.02	± .90			.83
All others		26	26.92	± 3.81			

One striking fact brought out by this table is that there are approximately three times as many subjects with 20/15 vision or better as with 20/20, although the latter is considered normal. A correlation between these two factors of depth perception and visual acuity gave a result of .457±.053, a figure which is more than eight times its probable

error and, therefore, a reliable indication that there is a definite relationship between the two, and that improvement in the former is associated with improvement in the latter. After applying Chauvenet's criterion to eliminate the extreme cases which were not typical of the group, the mean of depth perception was found to be 16.27 ± 1.02, which is lower than the average formerly obtained for all cases; the mean of visual acuity was $20/15 + 1$, which is a high average.

The subjects were next divided into two groups: (1) those qualified to fly, and (2) those disqualified because of poor visual acuity, low angle of convergence, muscle imbalance, color blindness, etc. The average depth perception judgments for each group were obtained, and they were found to differ widely. The mean in millimeters for the qualified group was $11.93 \pm .52$ with a coefficient of variability of .54, and the average for the disqualified group was 36.30 ± 5.72 and a coefficient of variability of 1.28. As more than 30 mm. disqualifies in the depth perception test, the size of the latter average is significant. After eliminating 1 extreme case in this group, the average is still 29.66 mm. The results show that the subject disqualified on any ophthalmologic finding is apt to have a depth perception average near the disqualifying limit and to make erratic judgments varying widely from the normal average. The qualified man, on the contrary, has an average depth perception far better than the standard requirements, and his judgments are more constant and reliable.

Of the 30 disqualified subjects, 9 failed to attain the required average of 30 mm. in depth perception. The average angle of convergence for all subjects was found to be $58.90 \pm .98$, and an attempt was made to discover a possible relationship between this angle of convergence and the diopters of accommodation of the right and left eyes, but as some of the necessary data were lacking in many cases, the results were wholly unreliable. A graphic representation of the comparison of the averages of the depth perception judgments of the two groups of subjects, based on their degree of visual acuity, with the average for the complete group is presented. The great difference in judgments of depth perception made with binocular and with monocular vision would tend to prove that it is the binocular parallax which is the all important factor in depth perception judgment, and the size of the retinal image, which operates in monocular vision is of practically negligible importance in judgment of distance. It is plain that for accurate depth perception judgment good binocular vision is necessary, and the results of these tests show that the better the visual acuity, the more exact the depth perception judgment tends to be. As the average—with both eyes—for all subjects both qualified and disqualified is 18.65 mm., it would seem that the standard which designates 30 mm. as a minimum depth perception requirement is not too high. On the contrary, from a consideration of the average for the complete group and for the qualified group, which is 11.93 mm., it is probable that the standard should be raised, and a minimum depth perception average of 25 mm. or 20mm. should be required.

See also No. 1005, Bauer, 1922

I. MONOCULAR VISION

See monocular vision

See also No. 914, Guilfoyle, 1932; No. 921, Walker, 1940

J. MUSCLE BALANCE

333. CLEMENTS, E. C.: *Discussion on ophthalmology in its relation to the Navy, Army, and Air Force. II. Judgment of distance*, Brit. M. J. 2:635-58, 1923.

Correct judgment of distance is a necessity in aviation. Failure to land a machine correctly is mainly due to faulty judgment of speed and distance, which is associated with lack of ocular muscle balance and poor binocular vision. From a financial consideration alone apart from injury to pupils and pilots, it is uneconomical to train such pupils owing to damage to machine, waste of instructor's time, unless something can be done along the lines of the author's previous experience to help these bad landers to do better and, thus, enable them to continue their training and to remain in the flying service, which was then (1916) urgently in need of fliers.

From the air all verticals are foreshortened, and the known size of objects, therefore, varied from those which we have learned as normal on the ground.

The action of centrifugal force on ocular muscle balance during turns, spins, loops, etc., has to be taken into consideration. If flying in a tight spiral looking in the direction of the airplane's course, or toward the center of the "funnel" down which one may be travelling, no unpleasant effects will be felt; but if one looks outward, that is, away from the center of rotation, the pain of having one's eyes apparently pulled out of the head is agonizing, and a more comfortable position will be rapidly taken up. On coming out of a spin the horizon will appear to be going round in the reverse direction, and if the action has been excessive, the pilot may be under the impression that he is not yet out of spin and make some further adjustment which results in his resuming spinning in the opposite direction with possible damage to himself or even fatal results. If a pilot has some tendency to imbalance, then it would seem that rotation will be likely to increase such tendency and to make his judgment faulty.

In conclusion the author observed that the independent investigation of Group Captain Flack, made on Air Ministry instructions in the war, showed 80 per cent of successes from eye training, and by only treating suitable cases this percentage has improved since that time. Not only is greater proficiency in landing obtained, but also in game shooting and all fast ball games.

The Air Ministry, after careful investigation of results, now sanctions the training of service officers who develop the defect and bad visual judgment, even though visual acuity is up to standard, is now a definite cause of rejection for candidates. Lastly, instructors are sufficiently satisfied with the results to apply at once for an opinion when a pupil shows signs of inability to land.

334. COLAJANNI, G.: *Binocular vision and depth perception (Visione binoculare e percezione della profondità)*, Riv. di Med. Aero. 2:240-51, 1939 (French, English and German summaries).

After demonstrating the importance of depth perception for safety in aviation, the author reported stereoscopic tests on subjects with monocular amblyopia, squint, and single vision. He believed that, with the exception of aviators of rare ability, pilots with impairment or loss of vision in one eye should be disqualified and that the same restrictions

pertain to applicants for commercial or military aviation whose errors of depth perception exceed 15 mm. deviation.

Regarding the notion of depth or relief perception, the author stated that the most important psychophysiologic factors, aside from the apparent size of the objects, are the aerial perspective, the shadows, the parallactic displacement, and the movements of convergence and of accommodation of the eyes.

From the apparent size of an object (or rather, the reduction in size), which it presents from far away, an idea can be obtained of the distance, if the actual size is known to the observer.

The aerial perspective is the amount of luminosity, clearness, and precision of the retinal image in relation to the more or less pronounced density of the aerial stratum separating the observer from the object.

Shadows influence the correct appraisal of distance insofar as an object projecting its shadow on a surface must necessarily be closer to the observer than the surface on which the shadow is seen.

The parallactic displacement of the point fixed by the observer, in relation to the non-fixed point, noticed by the changes of the position of the eye, is an indirect means of appraisal of distance. This applies especially to monocular vision.

According to Parinaud, one may appraise the surface of an object without intervention of ocular movement, owing to different localization in space of visible binocular images, according to whether identical or dissimilar points are formed, a function belonging exclusively to the sensory apparatus.

The convergence and the sensorial apparatus have distinctly different tasks and mechanisms, differing in the appraisal of the third dimension, since the convergence takes into consideration the distance, and the sensory apparatus, the surface of objects.

False judgment with regard to distance is the cause of at least 50 per cent of all accidents in aviation.

335. Davis, R. G.: *Aviation hygiene*, U. S. Nav. M. Bull. 25:832-37, 1927.

The advancement of aviation is closely related to the physical condition of the aviator.

The eyes are the most important factor of the physical requirements. Their care is essential to insure the best visual judgment. Visual acuity alone will not suffice for there must be a perfect balance of each extrinsic muscle allowing the maximum of binocular vision with no diplopia or nystagmus. The angle of divergence and convergence must remain unimpaired and all coordinated movements free from lagging. The presence of dust, oil, wind, and glare are prone to produce a congestion of the eyelids and conjunctiva, which, if allowed to progress, may greatly impair the visual judgment in depth perception for landings or formation evolutions in the air. Goggles with adequate side screens and lenses of plain nonbreakable glass, preferably tinted for tropical use, should always be worn. No refractive correction can be permitted, as a hasty removal due to fogging with oil, dust or frost may result in a blurring of vision at a critical time. Goggles must insure a wide visual field and should be mounted on a face pad of rubber or wool, insuring comfort and protection to the frontal sinuses.

Visual judgment may be impaired following a recent attack of influenza or any prolonged

application of the eyes. The many factors predisposing to visual error are easily overlooked unless their potential pathology is recognized.

336. Doyne, P. G.: *Ophthalmology in its relations to the Navy, Army and the Air Forces, Discussion in Section on Ophthalmology,* British Medical Association, 1923, Arch. Ophth. 53:193-96, 1924.

The correct estimation of space and distance is dependent upon "eye" in flying, as in games where a ball is hit. "Eye" in this sense is a component of all the senses of the body, though the most important contributions come from the visual apparatus. It is necessary for a pilot that the whole optic tract should function normally, and good binocular vision is essential. Heterophoria, more often than not, implies more than unequal action of the extra-ocular muscles. There is bilateral visual disharmony. A one-eyed man who will have acquired stereoscopic vision by other means is less dangerous for flying than a two-eyed man, one of whose eyes may be unreliable.

By training with the amblyoscope and stereoscope, patients who suffered from disabilities due to ocular muscle imbalance were relieved without recourse to prisms or glasses.

It was pointed out that in the artillery a myope with perfect visual acuity was more valuable in long-range work than a man with a less degree of visual acuity but with little defect in refraction because he was bound to use field glasses for his observations.

R. Pichard found symptoms of eyestrain and night blindness chiefly in men with hypermetropia of over 1.5 diopters.

337. Edridge-Green, F. W.: *Binocular vision,* Ophthalmoscope, 14:315, 1916.

Perception of binocular relief and solidarity is not dependent on the falling of images on disparate points of the two retinas; although when images do fall on adjacent disparate points, they are combined with an alteration in their projection in space. Stereoscopic photographs give only slightly better relief than two identical photographs in a stereoscope. Looking through stereoscope, cover one side, still have striking relief. Relief diminished if eye looking at white sheet is closed. Cover the upper half of one stereoscopic positive and make comparisons. Put white paper in center cutting off right half of left picture and left half of right picture, strong relief. It would appear that in ordinary binocular vision the right eye dominates for the right side and the left eye for the left of combined field unless the position of two points in space be noted,when one eye, usually the right, dominates. Molds for two images on disparate points when they combine, as, for instance, when the images of two daggers are combined in the stereoscope and appear as a dagger standing straight out from the table. The images in the stereoscope are similar to those thrown on the two retinas by a dagger standing straight out from the table. When the mind is not able to project the image of an object in space, which would produce the two images, double images or binocular struggle or rivalry take place.

Binocular struggle is observed when the half photographs are combined in the above way.

338. Litinsky, G.: *The speed of depth perception,* Vestnik oftal., 13:850, 1938.

Fast depth perception is important for aviators. The depth perception was examined by the author's apparatus in 109 subjects, mostly pilots (50 per cent), who had normal visual acuity. The pilots were much quicker in their depth perception than the other subjects,

i.e., the pilot's work has trained him to quick depth perception. In subjects who had heterophoria for distance the depth perception was slowed down. Litinsky believed that: (1) The quickness of depth perception is parallel to improvement of visual depth acuity and is decreased according to more difficult measuring problem. (2) The professional work of the pilots develops the depth perception and accelerates the process of depth perception at a distance. (3) The depth perception for distance is higher in orthophoria than in heterophoria.—Olga Sitchevska, M.D.

339. REIJNDERS, F. M.: *Binocular parallax and muscle balance.* Nederl. tijdschr. v. geneesk. 66:2051, 1922. Abstract: Internat. M. & S. Survey 4:82-649, 1922.

Reijnders discussed muscular imbalance in relation to aviation. He pointed out the importance of orthophoria in the aviator, particularly when making a landing. An instrument and method by which the parallax can be measured, giving the average figures found, are described.

340. SPEARMAN; BRAILEY, A. R.; CLEMENTS, E. C.; PARSONS, J. H.; CLARKE, E. AND FLACK, M.: *Discussion on visual requirements of aviators.* Arch. Ophth. 48:519-21, 1919.

In stereoscopic vision each eye has to form a good image and that depends principally on the optical excellence of the eyes. It seems to be considered that for binocular vision all that is required is for both eyes to function instead of only one. But there is only one visual field in consciousness though there are two ocular fields, and both ocular and conscious fields could not function with regard to the same spot at the same time. It was seldom that both eyes acted simultaneously; this was sometimes due to asymmetrical astigmatism. It was important to try to find out how the ocular movements tested the balance of muscles. The eyes took up the right position for clear-seeing if given plenty of time, but it did not necessarily follow that they would do so when speed was essential.

Binocular vision and a good sense of perspective were not always found to go together. No rejections were made on account of faults of muscle balance, apart from actual squint. Flying failures were not found to be more numerous among the wearers of glasses than among others. Perception of the parallactic movement of objects were regarded as the all-important factor, but this was found difficult to assess by any test. When making a landing at a high speed, it was difficult to see the details of objects, and Brailey did not think stereoscopic vision could be of great assistance in that operation.

The results of the ocular examination of approximately 4,000 candidates were given by A. R. Brailey. Lenses were allowed. The lowest vision allowed was 6/18 with the better eye, and 6/24 with the poorer, correctible to 6/6 and 6/9, respectively. Muscle imbalance was not a cause for rejection except in cases of actual squint. Flying failures were not found to be more numerous among those with corrections than among others. Brailey believed that muscle imbalance could not be corrected by training.

341. SPEARMAN, PROF.: *Stereoscopic vision.* Am. J. Ophth. 2:432-33, 1919.

Stereoscopic vision had been decided by many people to be the most important factor in the visual fitness of aviators, especially in regard to successful landings, a source of much

mortality among fliers. Spearman divided his remarks into: (1) a method of testing stereoscopic vision in candidates, (2) suggestions as to means of improving the vision of aviators.

This faculty had to be differentiated from quasi stereopsis, or the power of appreciating depth, which depended on the clues at the disposal of either eye alone. In stereoscopic vision, each eye had to form a good image and that depended principally on the optical excellence of the iris. It seems to be considered that for binocular vision all that was required was for both eyes to function instead of only one. But there was only one visual field in consciousness, though there were two ocular fields; both ocular and conscious fields could not function with regard to the same spot at the same time. It was seldom that both eyes acted simultaneously; this was sometimes due to asymmetric astigmatism. It was important to try to find out how the ocular movements tested the balance of muscles. The eyes took up the right position for clear-seeing if given plenty of time, but it did not necessarily follow they would do so when speed was essential. A test embracing the following of a moving field was, therefore, necessary.

See also muscle balance—depth perception.

See also: No. 652, Pol, 1935, No. 925, Pol, 1930.

K. ORTHOPTIC TRAINING

See: orthoptic training.

L. PERIPHERAL VISION

342. Loy, A. W.: *The value of peripheral vision in depth perception as applied to aviation.* U. S. Nav. M. Bull. 28:13-18, 1930.

In making proper contact with his environment, the aviator is absolutely dependent on vision. Muscle sense may aid him in perceiving motion changes but plays no part in determining his position in space. If deprived of all sensations except vision, the aviator would be handicapped, but he would be able to adjust himself to the aerial environment.

The aviator is of the intellectual type. Emotional impulses may bring about very undesirable results. His duty is hazardous, and his safety depends more on cool judgment than any other factor. The information of his relation to his environment, from which he forms his judgments, is received upon his retina.

The bird has the advantage of reflex equilibrium in flying, but it flies with monocular vision. Motion parallax, accommodation, and terrestrial association serves it for depth perception in alighting. Although the aviator must depend alone on his eyes in flying, he has the advantage of binocular vision in landing. The aviator with training could use monocular vision, but binocular vision affords better depth perception.

To the aviator, terrestrial association and motion parallax are of constant value. He keeps his central vision occupied with the position of his plane in relation to the horizon, or with the oil dial, or airspeed dial. During the whole time, peripheral vision notes changes in position of wings, of clouds, horizon, and other planes in the vicinity. By motion parallax, peripheral vision notes the movement of the nearer point against the movement of the eye, while that of the more distant object is with the movement of the eye.

M. STANDARDS

See: standards.

N. SPATIAL ORIENTATION

See: spatial orientation.

O. TESTS

See: examination—depth perception

P. VISUAL ACUITY

See: visual acuity—depth perception.
See also: No. 332, Deyo, 1922.

XXXIV. Diseases (General) And The Aviator's Eyes

A. AIR SICKNESS

See: air sickness.

B. ALLERGY

343. Woods, A. C.: *Allergy and immunity in ophthalmology*, Baltimore, Johns Hopkins Press, 1933, pp. 176.

The table of contents includes: general consideration on anaphylaxis, allergy and immunity; experimental studies on general ocular immunology; the relationship of allergy to focal reaction in the eye; allergic conjunctivitis; the antigenic properties and reactions of lens protein and uveal pigment; syphilis; tuberculosis; and therapeutic procedures.

C. AVIATOR'S DISEASE

344. Cruchet, R. and Mouliner, R.: *Aviator's sickness (Le mal des aviateurs)*, Compt. rend. Soc. de biol., Paris, 82:677-79, 1919.

Aviator's sickness includes the following phenomena: more marked vasomotor reactions, congestion of the face, humming in the ears, auricular pain, headache, tachycardia, sleepiness, and occasional syncope. Aviators participating in high altitude flying must have good sight and perfect hearing.

345. Frizziero, M.: *Aviator's diseases*, Minerva med. 1:61-65, 1930.

D. CARBON MONOXIDE POISONING

346. White, J. J.: *Carbon monoxide and its relation to aircraft*, U. S. Nav. M. Bull. 30:151-65, 1932.

Carbon monoxide, being a product of incomplete combustion, is present in the exhaust gas of all airplanes, sometimes in sufficient concentration to result in as much as 15 per cent saturation of the blood of the pilot. Exposure to low concentration over a long period is even more harmful than brief exposure to high concentration.

Carbon dioxide-oxygen mixture will remove the carbon monoxide from the blood somewhat faster than pure oxygen.

Among the affections, choreiform movements are common and convulsions frequent. The earliest and most constant ocular sign of carbon monoxide intoxication is congestion of the retinal veins and hyperemia of the optic disk. In one case pronounced impaired vision of about two weeks' duration was reported. The onset of blurred vision was accompanied by

the appearance of a yellow spot in the field of vision. Occasional diplopia was observed. Thorough examination showed injection of the bulbar conjunctivas, inequality of the pupils, blurred disk margins, and engorged retinal veins. The visual field showed contractions with sector defects for red and blue. Inability to distinguish green colors was found. Fifteen months later the eye involvement showed extensive chorioretinal lesions throughout the fundus and opacities in the vitreous. Vision right eye was 10/200 and left, 2/200.

Several other permanent visual defects following exposure to carbon monoxide are reported.

There is a bibliography of 33 items.

See also: carbon monoxide.

E. EAR

347. ACCORRINTI, V.: *Increase of light auditory disturbance in aviators with slight chronic catarrh in ruptured middle ear* (*Lieve disturbo funzionale uditivo aggravato intensamente, dopo un periodo di volo in un giovane pilota, affetto da modico catarro cronico nella cassa timpanica*), Arch. di antropol. crim. 48:264-67, 1928.

348. ACCORRINTI, V.: *Lesions of the auditory apparatus in aviators; 6 cases* (*Considerazioni su lesioni dell'apparecchio percettive negli aviatori*), Arch. di antropol. crim. 48:267-69, 1928.

349. BALLA, A.: *Impaired hearing of aviators; professional character* (*L'ipoacusia nel personale aeronavigante. Suo eventuale carattere "professionale"*), Valsalva, 5:397-406, 1929.

350. BILANCIONE, G.: *Observations on the vestibular apparatus of candidates for aviation and pilots, with special reference to nystagmus* (*Osservazioni sull'esame vestibolare dei candidati all'aviazione e dei piloti, specialmente in riguardo al nistagmo*), Gior. di med. mil., Roma, 67:164-75, 1919.

351. GOLDBERG, L.: *Diseases of labyrinth in aviators* (*Durch Fliegen erworbene Labyrintherkrankung*), Aerztl. Rundschau 37:67-68, 1927.

352. YOSHIDA T.: *Clinical observation on auditory organ in aviators*, Bull. Nav. M. A. Japan 18:1, 1929.

F. DISEASES DUE TO EFFECTS OF ALTITUDE

See: altitude-anoxia.

G. MALARIA

See: diseases—tropical ophthalmology.

H. MEDICAL OPHTHALMOLOLGY

353. KNAPP, A.: *Medical ophthalmology*, Philadelphia, P. Blakiston's Son & Co., 1918.

This book describes the anatomy and physiology of the eye. The eye is discussed in

relation to diseases of the nervous system, diseases of the glands with internal secretion, poisons, infectious diseases, diseases of the circulation, diseases of the respiratory tract, diseases of the digestive tract, anemia, diseases of the kidney, diabetes, diseases of the female osseous system, and skin diseases. Hereditary eye diseases are also described.

354. MOORE, R. F.: *Medical ophthalmology*. Ed. 2, Philadelphia, P. Blakiston's Son & Co., 1925.

This practical book gives a concise account of those pathologic conditions of the eyes and their connections which, for the most part, are of interest in general medical diseases.

I. MIGRAINE

355. ROOK, A. F.: *Physical efficiency and service flying*. J. Roy. Nav. M. Serv. 25:203-17, 1939.

Migraine with visual disturbance is a cause for rejection of candidates.

J. NOSE AND THROAT

356. BERENS, C. AND UREN, C. T.: *Effect of nose and throat infections upon ocular functions of aviators*. Am. J. Ophth. 3:170-77, 1920.

The periodic blurring of vision in nose and throat infections is sufficiently common to be the cause of an occasional crash.

Pilots suffering from nose and throat infections should not be permitted to fly, particularly when there is an enlargement of the blind spot. (A quick clinical method is described for mapping the blind spot. The patient's cornea is at 27 cm. from a 1 mm. black dot on a white card attached to the perimeter's arc; the limits of the blind spot are determined with a 2 mm. black test object at the end of a white rod and outlined with pencil on the card.)

Ten out of 38 pilots with nose and throat infection had affections of the extra-ocular movements. They improved after surgery or exercises.

K. SYPHILIS

357. IGERSHEIMER, J.: *Syphilis and the eye*. *Syphilis und Auge*. Ed. 2, Berlin, J. Springer, 1928.

This is a comprehensive discussion of syphilis and the eye. It is beautifully illustrated.

L. THYROID GLAND

358. BRADSTREET, A. M.: *Malfunctions of the thyroid gland in relation to aviation*. Northwest Med. 28:215-18, 1929. Also Mil. Surgeon 65:233-40, 1929.

Recently Holloway, in a paper dealing with eye changes in goiter, included a high

degree of ocular imbalance and "a near point greater than 9 cm." among symptoms of malfunctioning of the thyroid.

Myxedema is a condition due to marked deficiency of thyroid secretion. There is pronounced hyperplasia, accompanied by exophthalmos. However, cases of hyperthyroidism, with little enlargement and no apparent exophthalmos, require special attention.

Adenomatous goiter is nodular in conformation; the symptoms are the same as those of hyperplastic goiter, minus the exophthalmos and nervous symptoms.

Exophthalmic goiter is pathologically a simple diffuse hyperplasia.

Colloid is a large symmetrical goiter.

A person with a high degree of ocular imbalance and low angle of convergence, becoming easily fatigued and exhibiting muscular weakness, may be simply subject to chronic exhaustion but should always be suspected of having malfunctioning thyroid.

A flier, complaining of losing interest and "growing stale," may be developing thyroid malfunction. If this is proven, he may be considered "damaged goods," as far as flying is concerned.

A basal metabolism check should be made, and appropriate treatment instituted.

Individuals suffering from any of the above, hyperthyroidism, or a hypofunctioning thyroid gland, should, even in mild cases, never participate in pursuit or attack maneuvers, nor prolonged cross-country flights.

M. TROPICAL OPHTHALMOLOGY

359. Bureau of Hygiene and Tropical Diseases: Tropical disease bulletin, Keppel Street, London W.C. 1, 1938. Including section on Tropical Ophthalmology. Vol. 35 (pp. 411-15) (p. 523) (Vol. 13-1919).

Pterygium; trachoma; keratomalacia (for which the therapy is vitamins B and C as useful adjuvants to cod liver oil); cataract; glaucoma; sympathetic ophthalmitis; and eye affections in leprosy are discussed. Eighty per cent of all leprous patients develop ocular complications. Tarsorrhaphy is often needed and is done by splitting the outer portion of the lower eyelid and excising triangular portions of skin and tarsus. When epiphora is very troublesome, the accessory lacrimal is first partially excised. Electro-coagulation has been found to be the best treatment for leprous nodules in the episcleral tissue. Iridectomy, if necessary, should be wide, in order to minimize the risk of closure by exudation. Novocaine infiltration is preferable to cocaine anesthesia in this case.

In 1933 in Egypt about 80 per cent of blindness was due to conjunctival diseases. Smallpox is a frequent cause of blindness in insufficiently vaccinated communities. In India glaucoma, mostly chronic, accounts for 10 per cent of the total eye diseases. Corneal ulcers in India are usually treated with application of silver nitrate grs. 60: oz. 1 to the whole eye, followed by irrigation. This seems rather drastic. Holland prefers intracapsular method of cataract extraction, by adopting modified Smith technic.

Peripheral iridectomy is usually performed before lens delivery. Five per cent of iris prolapse seems rather high. A lower rate might be obtained, if iridectomy were performed subsequent to delivery. A paper by J. A. Mohammed on the pathology of the meibomian glands is quoted. The liability of the glands to be affected by general seborrheic conditions, and their role in causation and maintenance of conjunctival and corneal diseases is described.

Ninety-nine per cent (42 per cent of which in severe form) of the pupils in primary government schools in Egypt were found to be trachomatous, which is connected with a climatic seasonal rise in temperature. Blindness in Egypt is said to be caused by acute ophthalmias; the gonococcus is stated to be the predominating infective agent. At the onset of conjunctival infection by pathogenic organisms, closely followed by trachoma, "inclusion bodies" are found in every case.

"Snake venom in ophthalmology" by Sergio Valle is cited (Revista Brasileira Leprologia, S. Paulo, 1937, Dec. pp. 481-500), according to which paper in cases of leprosy, cancer and tabes, benefit from conjunctival and retrobulbar instillation of 0.5 cc. of Crotalus anavenin with 1.5 cc. physiological saline (the number of drops depending on the intensity of pain) is recorded. The remedy acts on the ciliary nerves and on their peripheral endings, "blocking all ocular sensitivity."

360. ELLIOT, R. H.: *A treatise on tropical ophthalmology.* London, Henry Frowde and Hodder & Stoughton; also Oxford University Press, 1920. 534 p.

Atmospheric and domestic conditions in the tropics appear to be especially favorable to growth and dissemination of organisms responsible for conjunctival diseases, with the result that epidemic seasons come around with unfailing regularity. Sometimes, in one morning 30 to 50 fresh cases of catarrhal ophthalmia were seen by the author. At such times, other conjunctival conditions are severely aggravated. This refers to India, Afghanistan, Persia, China, Egypt, and the broad lands of Africa. In these countries abuse of "home-made" preparations leads frequently to blindness.

Physical properties of bright light are discussed with regard to the effect on the retina, as follows: Since the aqueous cuts off most of the heat-rays, and the cornea, lens, and vitreous bar the passage of the great majority of ultra-violet rays, it may be assumed that only the luminous rays are left, at least in any dangerous quantity. The removal of the lens greatly alters the quality of solar rays reaching the retina, the volume of ultra-violet light admitted being considerably increased thereby. It is, however, believed that the retina, even of the aphakic eye, is sufficiently protected by the cornea and vitreous under ordinary conditions, but under abnormal conditions the results of findings have been contradictory, some believing that retinal lesions are due to excess of light, whereas others maintain that it is only when the concentration of light involves enough heat energy to produce definite thermic lesions, that the retina is likely to suffer damage.

Glare asthenopia and glare conjunctivitis are discussed; atropine may be of great service; argyrol drops (12½ per cent) should be freely instilled at frequent intervals. Injuries of the eyes by lightning are described, including electrolytic action, also the actinic influence in transit of the ultra-violet rays. Scotoma from sun-blinding and eclipse scotoma are discussed. Night blindness, erythropsia, cyanopsia, pinguecula, and pterygium are described in detail. Infection through anthropods, flies, leeches, etc. is discussed, also filarial conjunctivitis.

361. GIFFORD, S. R.: *Further note on ocular sporotrichosis.* Arch. Ophth. 53:264-66, 1924.

In 1922 a case was reported by Gifford, regarding a male patient with an infectious

process starting in the lacrimal sac which had destroyed its bony wall back into the ethmoidal cells. Sporothrix Schenkii was grown from the lesion in pure culture.

Another case in a female patient is reported in detail. The cultures showed five colonies which developed the dry, mammellated appearance characteristic of sporothrix. Smears showed the typical branching, threads with spores budding laterally from the branches near their ends.

The organisms may often find their original lodgment in the lacrimal sac, after having been blown into the eye with dust. Later they grow in the walls of the sac or the surrounding tissue.

362. McKee, S. H.: *Blastomycosis of the Eye*, Arch. Ophth. 3:301-05, 1930.

Blastomycetic dermatitis is caused by a fungus. It is of especial interest to ophthalmologists because of the frequent involvement of the eyelids in the pathologic process. It is found chiefly among laboring people, with a larger proportion in males than in females.

Beginning as a papule, there is formed a characteristic indolent wartlike lesion which later presents a raised papillomatous appearance.

According to Busche, purulent destruction of the cornea is among the pathologic lesions mentioned.

The pathologic change of the skin consists of extensive keratosis with inflammatory reaction of the granulomatous type. Yeast cells are present within the giant cells or free in the tissues. Mycelium is rarely seen in man.

The treatment consists of potassium iodide in heroic doses of from 2 to 400 grains daily. X-rays are also helpful, or the two combined.

363. Barros, J. M. de: *Clinical aspects of ocular leprosy (Aspectos Clinicos do Comprometimento Ocular da Lepra)*. Servico de Profilaxia da Lepra do Estado de São Paulo, Brazil, 1939.

This monograph is published in Spanish and in English. It contains descriptions of the effect of leprosy on the eyebrow, eyelids, conjunctiva, sclera, cornea, and iris.

364. de Schweinitz, G. E.: *Additional experiments to determine the lesion in quinine blindness*, Tr. Am. Ophth. Soc. 6:23, 1891-93.

The first effort to produce amblyopia experimentally with quinine in this country dates from 1890 when a series of researches by de Schweinitz demonstrated that toxic doses of quinine in dogs produced a replica of the picture of the fundus in human beings, atrophy of the nerves, optic tracts and chiasm.

365. Berbanescu, V.: *Malaria among aviators*, Rev. san. mil., Bucuresti, 28:19-21, 1929.

366. Daniels, C. W.: *Eye lesions as a point of importance in directing suspicion to possible trypanosome infection*. Ophthalmoscope 13:595-97, 1915.

Grounds for suspicion of the above are: continued pyrexia, not yielding to quinine;

enlarged cervical glands (or others); erythematous circinate rash (the most valuable for diagnostic purposes present in early stages); ocular symptoms; orchitis; delayed pain after deep muscular bruising, and cardiac irritability and weakness.

In many points there is similarity to syphilitic infection with positive Wassermann in certain cases.

Special reason for viewing eye lesions with suspicion is that they are the first to cause the patient to take medical advice.

The eye lesions are essentially toxic iridocyclitis, keratitis, circumcorneal congestion, conjunctivitis, and photophobia.

Quite often edema on one or both eyelids and beneath them is observed.

367. GREEN, J.: *Ocular manifestations in brucellosis (undulant fever)*, Arch. Ophth. 21:51-67, 1939.

Ch. Nicole made the prediction that Mediterranean fever is in the course of evolution and is tending to become chronic. Because of its manifestations and chronicity, it will become one of the commonest and most stubborn diseases.

Regarding the eye, the ciliary body is most affected, and there is infiltration of lymphoid and epithelioid cells. The vitreous is often fluid. In the posterior portion of the uvea migration of the subretinal pigment with round cells and fibrin is observed.

The external ocular muscles, the cornea, uveal tract, retina and the optic nerve proved vulnerable.

However, brucellosis does not destroy the integrity of the eyeball.

N. TUBERCULOSIS

368. RABINO, A.: *Dangers of aviation during pneumothorax*, case, Minerva med. (pt. 1) 9:624-26, 1929.

O. VIRUS DISEASE

369. GIFFORD, S. R. AND LUCIC, L. H.: *Sympathetic uveitis caused by the virus of herpes simplex*, Tr. Sect. Ophth. A. M. A. 1926, p. 20-42.

The findings of v. Szily are confirmed, namely, that the virus of herpes simplex, when inoculated in a ciliary pouch, will reproduce in a certain percentage of rabbits uveitis of the second eye resembling, clinically and histologically, the picture of human sympathetic ophthalmia.

It was also possible to produce uveitis of both eyes by injection of the virus in the region of the chiasm.

The active virus could be demonstrated in the second eye by positive corneal inoculations; and, in one case, uveitis of both eyes was produced by inoculation from the second eye to a ciliary pouch. A further positive corneal inoculation from the second eye was obtained, showing transmissions of the virus through three generations from the first sympathizing eye.

Herpes corneae of the opposite eye occurred in six per cent of the animals inoculated in a ciliary pouch.

Sections indicated extension of the process by way of the nerves and chiasm to the other eye; this was confirmed by positive inoculations from points along this route.

Inoculations from a human case of sympathetic ophthalmia were negative.

The possibility of a filtrable virus with neurotropic properties similar to those of the herpes virus being the cause of sympathetic ophthalmia is given some support by this work.

XXXV. Disqualifying Defects

A. COLOR VISION ANOMALIES

See disqualifying defects—visual acuity.

See also: No. *1099*, Davies, 1940; No. *1221*, Lawrence, 1930.

B. CORRECTION OF DISQUALIFYING DEFECTS

370. McGRANE, L. H.: *Eyes—how to correct them*, West. Flying 9:32-34, 1931.

The author pointed out that the following eye defects respond to treatment: poor vision with or without lenses, horizontal muscular insufficiencies, double vision, partial blindness, and green blindness. Among the defects not responding easily to treatment were listed: subnormal depth perception, suppression of vision of one eye, and vertical muscular insufficiencies. The following defects do not improve after treatment: corneal scars, blind spots, and internal and external diseases.

See also: Orthoptic Training.

C. DEPTH PERCEPTION

See: No. *133*, Clements, 1923; No. *643*, Hoffmann, 1936.

D. GENERAL DISCUSSION OF DISQUALIFYING DEFECTS

371. COOPER, H. J.: *The relation between physical deficiencies and decreased performance* J. Aviation Med. 1:2-24, 1930.

Physical departures from the normal correlate well with decreased performance. The examiner should never feel so sorry for an applicant that he may overlook the possible aeronautical significance of a defect.

A man should be able to handle his plane with his natural visual acuity in case his goggles become misted or smeared with oil, thereby necessitating their removal, or in case they become lost in flight. Vision less than 20/50 is dangerous in that the acuity is too low to permit him to recognize obstructions clearly in his glide to the field and on the take-off, and other planes in the air would not be seen readily. Poor visual acuity might result in a crash on landing.

When corrections are required in goggles, they should be ground into the goggle lens. There is something in favor of the practice of wearing spectacles under goggles when the correction is a high one.

Poor depth perception is a very common accompaniment of fatigue, and experienced

pilots frequently complain that they are having trouble with their landings, although they feel well physically.

Ocular muscle imbalance is in itself a cause of fatigue, and it may result in carelessness. In addition there is always the danger of diplopia. Bad landings are frequently due to ocular muscle imbalance.

Color vision is important because the pilot must detect and distinguish navigation and boundary lights, colored signal lights, and panels, as well as read colored maps and see the different shades of brown and green seen on the ground which aid in indicating the character of the terrain and in picking out emergency landing fields.

The pilots who have little or no accommodation have difficulty in reading their instruments. When this difficulty is present, the pilot tends to avoid looking at them, and such neglect may result in trouble that could have been avoided.

The pilot must, when looking straight ahead, be able to detect objects in his peripheral fields of vision. The peripheral portions of the retina are normally sensitive to objects in motion, and, therefore, the fields must not be restricted.

See also; No. *643*, Hoffmann, 1936; No. *1042*, Cooper, 1933; No. *1069*, Schnell, 1935; No. *1071*, Wegerdt, 1930; No. *1075*, (British) Air Ministry, 1930.

E. INCIDENCE

372. Benson, O. O., Jr.: *An analysis of the causes of disqualification of five hundred applicants rejected for flying training.* J. Aviation Med. 8:3-11, 1937.

In a random sample of 500 applicants who were rejected for flying training, 62.2 per cent were rejected because of their eyes, 8.4 per cent because of ear, nose or throat, 19.4 per cent because of findings in the general physical examination, and 10 per cent on the basis of the neuropsychic examination.

Of the optical defects, visual acuity accounted for 28.6 per cent of the 62.2 per cent; depth perception, 8.8 per cent; heterophoria at 6 M., 5.6 per cent and heterophoria at 33 cm., 2.0 per cent accounted for others. The remaining defects were spread out over prism divergence, accommodation, refraction, color blindness, etc.

373. Ickstadt, A., Jr.: *Physical qualifications and aeronautical adaptability.* U. S. Nav. M. Bull. 27:9-16, 1929.

Aeronautical adaptability should be determined through neuropsychiatric examinations.

Of the students in seven successive aviation classes, 50.9 per cent failed to pass their final check because of ocular imbalance, deficient depth perception, lateral ocular poise, esophoria, exophoria, hyperphoria, anisometropia, lack of accommodative power, and variations in labyrinthian response.

374. Leedham, C. L.: *Causes of failure in the physical examination for flying as seen in cadet applicants.* Mil. Surgeon 86:583-88, 1940.

Only 292 of 1,000 applicants for flying in the Army Air Corps were accepted. The principal causes for rejection were: cardiovascular, 27.4 per cent; flying adaptability rating,

21.9 per cent; visual acuity, 13.1 per cent; height-weight relationship, 13.1 per cent; depth perception, 12.3 per cent; angle of convergence, 11.8 per cent; accommodation, 10.0 per cent; nasal defects, 6.5 per cent; dental defects, 6.5 per cent and color vision, 6.2 per cent.

375. MOLODTZOV, N.: *On medical selection of military flying candidates*, Vo.-sanit. Dyelo, No. 3:40-44, 1935.

This article presents a plea for the extension of the influence of the Sanitary Service in the Schools of the Air Force of the Red Army. The author presented a table showing the causes of rejection for this service in 1934—a year with high standards:

	Per Cent
1. With neuropsychologic diseases	15.4
Of these, functional disturbance of the nervous system	8.0
2. With diseases of internal organs	24.1
Of these, functional disturbance of heart	16.1
3. With surgical diseases	18.9
4. With diseases of otorhinolaryngeal system	12.9
a. functional disturbance of vestibular apparatus	5.1
b. deficiency of hearing	1.2
5. With deficiencies of organ of vision	19.7
a. latent strabismus	2.2
b. deficiencies of color sense	3.4
c. deficiencies of visual acuity	5.3
6. With skin diseases	1.1
7. With deficiencies in length of leg	6.3
8. With other diseases	1.3

376. UNITED STATES ARMY: *Statistics showing results of physical examination for flying 1920 (Air Medical Service)*, Air Serv. Inform. Circ., No. 340:10-15, 1921.

The greatest cause for disqualification was vision, which represented 148 out of 893 cases. Muscle balance was second with 95 cases. Fifty-two cases of muscle imbalance (of 217 defects) received waivers, while 50 cases of improper vision received waivers.

377. WURDEMANN, H. V.: *Statistics of a thousand physical examinations for aviation*, J. Aviation Med. 8:13-21, 1937.

Age has little relation to flying ability except when presbyopia begins and reaction time becomes slower.

The author reported on 1,022 examinations of 621 persons in which 403 had one examination each. Of this number, 52 were passed with orders to wear glasses when flying; most of these were myopes. Of the rejections: 15 were on account of low visual acuity; 4 for color blindness; 13 on account of disturbances of binocular vision or imperfect judgment of distance; 9 for heart disease, high blood pressure and general condition; 3 for defective hearing; 7 for undeveloped personality.

See also: No. 666, Gore & Lawton, 1936.

F. MUSCLE IMBALANCE

378. ADAMS, J. C.: *Physical examination for flying with special reference to the eyes,* U. S. Nav. M. Bull. 26:861-68, 1928.

Summarizing the problem of physical examination of aviators, the rejection of a large number must be taken for granted, over half of which through defects of the eye.

Among the latent defects, muscular imbalance is the chief source of rejection. Exophoria is by far the most common of these defects, tending to increase with flying. Regarding increase in the allowance of hyperphoria to 0.75 D., this is considered the maximum consistent with safety. Esophoria is not a serious source of trouble and causes comparatively few rejections. With regard to latent hyperopia, 1.50 D. may be safely allowed as a routine measure, if it is not associated with esophoria or exophoria near the disqualifying limits or excessively low accommodation.

An angle of convergence below 40 degrees should remain a cause for rejection, if combined with more than 7 D. of exophoria at 33 cm. An angle below 40 degrees but above 35 degrees is consistent with safety, if associated with less than 8 D. of exophoria at 33 cm. The angle of convergence tends to increase with flying.

The present allowance for accommodation, color perception and stereoscopic vision should be maintained.

379. BRAILEY, A. R.: *Results of ocular examinations,* Am. J. Ophth. 2:433-34, 1919.

The visual standard in the ocular examinations of about four thousand candidates for the Air Service was at first very high, but later it was somewhat relaxed, and the fitting of lenses to the flying masks was permitted, and they proved quite satisfactory. Some officers asked for a different shape, and others requested tinted glasses on account of glare. The lowest visual acuity permitted was 6/18 with the better eye, 6/24 with the weaker eye, corrected by glasses to 6/6 and 6/9, respectively. Binocular vision and a good sense of perspective were not always found to go together.

Flying failures were not found to be more numerous among the wearers of glasses than among others. Little could be done in the way of correction of muscle defects by any form of training, however continuously carried out. It was useless for a man to see perfectly unless he could accurately interpret and act quickly in accordance with his perception. One very successful flying man in the service had 5 D. of myopia in each eye, and (probably as a result of wearing glasses) he had but indifferent binocular vision. A too stringent standard would exclude many otherwise desirable men.

Discussion: Major Clements said 26 per cent of the men who came under his observation had glasses ordered, and they were turned down on account of bad landings. He described in detail the tests he employed and the results obtained. Of 294 men, 60 per cent, who were rejected on account of having made bad landings, had been in clerical or other close occupations. The good flier looked at his horizons and used the nose of the machine as a protractor for measuring the flying angle.

380. LOY, A. W.: *Disqualifying eye-muscle imbalances in aviators,* U. S. Nav. M. Bull. 27:335-38, 1929.

It is the purpose of this paper to present a diagrammatic representation of the disqualifying eye-muscle imbalances, which appear in the examination of applicants for aviation duty.

It is relatively a simple matter to detect eye-muscle imbalance, to measure that imbalance by prescribed procedure, and to point out disqualifying conditions; but it is more difficult to understand the cause of disqualification, other than by reference to requirements by regulations.

Usually visual acuity is normal because of the requirements for entry into the service, but the testing and interpreting of the muscle balance becomes the chief responsibility of the flight surgeon in the eye examination. Esophoria may be due to weakness of the divergent group of muscles, which is made up of the lateral rectus, the inferior and the superior obliques. A weakness of the left superior oblique or of the right inferior oblique will cause a left hyperphoria; a weakness of the right superior oblique or of the left inferior oblique will cause a right hyperphoria. Such hyperphorias may be associated with weakness of divergence. Diplopia on the tangent curtain would be of the homonymous type, and the false images would be slanting in the lateral positions because of the cyclophoria.

Hyperphoria may be due to overaction of the superior or inferior recti muscles, which results from over adduction associated with effort of accommodation in hyperopia.

See also: No. *340*, Spearman et al, 1919; No. *599*, Grant, 1920; No. *938*, Mikhailov & Totrov, 1938; No. *940*, Thorne, 1930; No. *1120*, Stitt, 1929.

G. PATHOLOGIC DEFECTS

See, No. *1116*, U. S. Army, April, 1940; No. *1121*, U. S. Navy, 1939.
See also: standards.

H. VISUAL ACUITY

381. ANON.: *Report of the Department of Personnel Inspection to the Commissioner of Aeronautics, State of Connecticut, July 1, 1928 to June 30, 1930*, J. Aviation Med. 2:59-65, 1931.

The following impairments were found in 178 applicants in Connecticut between April 1, 1927 and October 1, 1930; visual acuity, 40 cases; depth perception, 34; defective color vision, 19, etc.

382. BENJAMIN, J. D.: *Analysis of Aviation physical examinations*, Mil. Surgeon 65:693-95, 1929.

Thirty-five of the people rejected were disqualified because of visual acuity, that is, inability to read 20/20. Either these men had poor vision on entrance to the service or else the demands of the service affected their eyesight. Vision as a rule does not improve with age, and, therefore, a man with poor or mediocre vision will probably get worse as time goes on.

In addition to the 35 men disqualified for visual acuity, 39 others were rejected for kindred conditions of the eyes such as refractive error, muscle imbalance, faulty accom-

modation and low angle of convergence. Some had more than one defect. Eyes, then, became the most frequent cause of rejection for 74 out of 103 had some form of eye defect. Either the service makes too great a demand on the eye or else the youth of today are showing a deterioration in vision, or possibly the physical requirements for Naval aviators are too severe.

Color blindness is supposed to be a powerful factor in crashes as a person afflicted with green-brown blindness would have difficulty in determining the nature of the terrain below him in case a forced landing became necessary. Four men were rejected because of defective color vision.

383. COOPER, H. J.: *How flynd performance determines the proper physical standards for pilots.* Nat. Aeronaut. Mag. No. 2:45-49, 1931.

The headings of the subdivisions are: physical defects hamper the man who flies; waivers premised on limited performance are dangerous; encouragement of individuals poorly qualified is unsound; errors of judgment loom large in accidents; private pilot requirements are less exacting; medical examinations maintain physical standards.

Clear vision is a most important sense and must be present to a reasonable degree without glasses. A minimum visual requirement of 20/50 is exacted of students (visual acuity at 20 feet being in such cases equal to the normal acuity at 50 feet). Vision less than this is too defective for flying; and the use of correcting lenses for a reasonable amount of natural normal vision is unjustifiable and unsafe.

An analysis of defective vision shows that even within qualifying limits they influence unfavorably the performance of students and pilots. Besides, the matter of obtaining satisfactory lens corrections in goggles is difficult, unpractical and expensive.

Usually the defective vision met with in applicants has been present for many years. Such persons may never have had clear visual acuity without glasses.

Aside from the direct effect of a physical defect, the cause of a poor performance may be due to an associated defect of the higher brain centers of which the physical defect is merely an objective expression.

384. COOPER, H. J.: *Further studies on the effect of physical defect on flynd ability.* J. Aviation Med. 2:162-71, 1931.

A study of 30,000 examinations was made. Of those physically normal, 30.5 per cent progressed to a private or higher grade license within a year. Of those with minor physical defects 17.0 per cent progressed in this time; of those with major defects 14.7 per cent advanced to the higher license; and of those whose disqualifying defects were waived, 4.1 per cent obtained the higher license in the time allowed.

The progress rate for minor eye defects were as follows: defective vision (20/20—20/40), 17 per cent; moderately defective color vision, 14 per cent. For major eye defects the rates were: defective vision (20/40—20/50), 21.5 per cent; ocular muscle imbalance, 4.1 per cent.

See also: visual acuity—defects.

See also: No. 63, Pol, 1937; No. 380, Loy, 1929; No. 666, Gore & Lawton, 1936; No. 667, Truby, 1921; No. 718, Halben, 1914; No. 874, Trexler, 1938.

XXXVI. Drugs and Aviators' Eyes

A. ALCOHOL

See altitude-anoxia—alcohol.

B. CAFFEINE

385. KRAVKOV, S. V.: *The influence of caffeine on the color sensitivity.* Acta Ophth. 17:89-94, 1939.

The author reviewed the literature on the effects of caffeine and coffee on the eye and described his own method for testing the effect, if any, of caffeine on the color sense. He worked with three women with normal color vision (ages 17 to 46). Using a Schmidt and Haensch spectroscope and a diaphragm, the visual field was made to equal a square each side of which was seen by the subject at an angle of 1.3° thus exciting the foveal region of the retina. The purpose was to determine "threshold or chromaticity" by diminishing brightness of the stimulus. Color sensitivity calculated as inverse of threshold.

On alternate days 0.1 gm. pure caffeine was given between the thirty-first and forty-second minute of dark adaptation. Sensitivity at 35 minutes was arbitrarily set at 100 in all tests. The author used red-orange rays of length of 590 m-mμ and green rays of wave length of 530 m-mμ. He presented a table giving the results of a test with each of the subjects. His conclusions are as follows: (1) Caffeine heightens the color sensibility of the eye; (2) the heightened sensibility may be observed in regard to the reddish orange rays, which excite mainly the red-sensitive apparatus of the eye, as well as with regard to the green rays which affect the green sensitive apparatus; (3) the effect of caffeine (in doses of 0.1 grams) begins to influence the color sensitivity within 20 minutes after the caffeine has been taken and last for more than 40 minutes; (4) the maximum increase of color sensibility attained in these experiments averaged 40 per cent.

C. MISCELLANEOUS INFORMATION

See: No. 176, Seitz & Barmack, 1940; No. 416, Ono, 1943; No. 421, Kirchhof, 1940; No. 772, Baker, 1937.

D. QUININE

386. RICHARDSON, S.: *The toxic effect of quinine on the eye.* South. M. J. 29 :1156-64, 1936.

Amaurosis and amblyopia resulting from the use of quinine have been described in the literature from time to time during the last century. Of more than 200 cases reported, all pertain to the effect on the eye following the direct administration of the drug to the patient.

The prenatal effect of quinine is to be considered. Some of the so-called congenital blindness may be attributable to its administration to the mother during pregnancy.

The findings in the 9 cases reported in this series coincide with those of many other authors. In two of these cases, however, the use of quinine in prenatal medication is a suggested etiologic factor.

Experimentation with animals indicates that the toxic effect of quinine on the ganglion cells of the retina is the primary cause of damage to the eye and that the vasoconstriction of the retinal vessels is a secondary factor.

The use of vasodilators, hypodermically and intravenously, is recommended.

Sympathectomy, as used in retinitis pigmentosa, is suggested in the treatment of patients in whom contraction of the visual fields and reduced vision persist.

E. STRYCHNINE

See: No. *154*, Seitz, 1940; No. *190*, Seitz and Rosenthal, 1940.

F. SULFONAMIDES

See: No. *189*, Rosenthal, 1939.

G. TOBACCO

See: tobacco.

H. VISUAL REACTION TIME

See: No. *1242*, Camus and Nepper, 1916.

XXXVII. Equilibrium

A. ALTITUDE

See: altitude-anoxia—equilibrium.

B. EXAMINATION

See: examination—equilibrium.

C. MISCELLANEOUS INFORMATION

387. Balla, A: *Post Rotatory phenomena in vagotonic and sympathicotonic applicants (Fenomeni secondari all rotazione nelle persone a tipo vagotonico ed a tipo simpaticotonico)*, Valsalva 2:537-40, 1926.

388. Culbertson, L. R.: *What is the cause of defective orientation or equilibration?* Ann. Otol., Rhin., & Laryng. 27:187, 1918.

George T. Stevens used Helmholtz's haploscopic experiment and invented his clinoscope, which demonstrated that many people had declination of the vertical meridians because the bony orbits were not plumb. Many people who have declination are subject to dizziness and are afraid to go in crowds or high places. The author believed the labyrinths might have the same inclinations or declinations and cause faulty equilibration. He suggested research examinations of the labyrinth on people who have died and were known to have faulty equilibration.

389. Faelli, C.: *Muscular sense in aviators (Il senso muscolare nei piloti degli aeroplani)*, Med. ital. 11:194-217, 1930.

390. HAAN, P. DE: *The importance of the sense of equilibrium for the aviator (De beteekenis van het evenwichtszintuig voor den vliegenier)*, Nederl. Tijdschr. v. geneesk 71: 463-66, 1927.

The otolith system is of great importance to the aviator in connection with acquiring and maintaining "the feel of the airship." This is pure feeling and direct reaction to extremely slight deviations from the normal flight position.

If sudden tilting occurs, the head maintains its normal position with the aid of the labyrinthine reflex.

This deviation from the horizontal position is sensed by the flier because of the bending of the spinal column, which occurs as a result of this position of the plane.

The flier reacts quickly to this discovery of inclined position by appropriate movement of the steering apparatus, for restoration to horizontal position. In time, this movement occurs automatically.

391. LEIRI, F.: *Vestibular apparatus in aviation (Über die Bedeutung des Vestibularapparats bei der Aviation)*, Ztschr. f. Hals-, Nasen- u. Ohrenh. 17:381-91, 1927.

392. NOLTENIUS, F.: *Flying in relation to the Vestibular Apparatus (Flug und Otolithenorgan)*, Ztschr. f. Hals-, Nasen- u. Ohrenh. 19:300-309, 1927-28.

393. PFEFFER, C. A.: *The vestibular tests as employed by the Army (U. S.) Air Service*. Mil. Surgeon 59:435-38, 1926.

The most important physical factors involved in flying are the eye and the nervous system. The Bárány chair examination followed by the caloric tests if the Bárány test is unsatisfactory, are used by the Army.

394. RUGGLES, W. G.: *Education of the vestibular sense*. Larynogoscope 31:6-11, 1921.

In flight the airplane is capable of complete rotation in any direction. Man, not being accustomed to such movements, when subjected to maneuvers of that nature, loses ability to coordinate muscle action, until education has progressed for a space. When unaccustomed rotations and positions are in rapid succession, the muscular action might, owing to the inability of the brain to assimilate such a flood of information, be entirely lacking, or of a violent or unintehigent nature. The muscles might become rigid.

395. SEIFFERT, G.: *Psychotechnical examination of the sense of equilibrium in aviators (Die psychotechnische Prüfung des Gleichgewichtssinnes bei Fliegern)*. Prakt. Psychol. 1: 81-87, 1919.

The majority of fliers believe that it is the organ of equilibrium which directs them, but some claim that it is the eye alone. The author described a test to solve this problem. No results are given.

D. SPATIAL ORIENTATION

See: spatial orientation.

E. VISUAL FACTORS

396. ANON: *Aviation problems, with special reference to the internal ear and the cerebellum*, Soc. Proc., J. Nerv. & Ment. Dis. 49:227-33, 1919.

In testing the balance mechanism, it is necessary to insulate the person from all other afferent impulses, for applicants will orient themselves by any means at hand: visual, tactile, auditory, deep sensibility, or olfactory.

397. CHAMBERLIN, W. B.: *Medical examination and the Aviation Corps*. Cleveland M. J. 26:545-48, 1917.

Man's knowledge of his position in space is gained from three sources: (1) his muscle sense, by which he recognizes, e.g., whether his forearm is extended or flexed and whether his feet are dangling or planted on the ground; (2) his eyesight by which he is made conscious of his relation to surrounding objects; (3) his vestibular apparatus, the utricle, saccula, and semicircular canals. This apparatus, though situated in the petrous portion of the temporal bone, in close apposition to the organ of hearing, has possibly less to do with the latter than it has with the organ of seeing. The aviator, seated in his machine, receives little or no help from his muscle sense, while his frequent passage through dense clouds or at night in complete darkness may deprive him of any sense of orientation ordinarily gained through his eyes. He has become, for the moment, the bird flying through a fog or mist, or the bat which flies at night only. In such cases he must depend entirely on a proper sense of equilibration, gained through an intact and unimpaired labyrinth.

The testing of the vestibular apparatus involves an interesting bit of technical knowledge, discovered and elaborated by Robert Bárány of Vienna.

The applicant is first placed on a revolving chair. With eyes closed and head tilted 30 degrees forward, thus bringing both horizontal semi-circular canals into the plane of the turning, he is revolved 10 times to the right in exactly 20 seconds, when the chair is brought to rest by means of the stop pedal. With vision directed on a distant object, there should now occur a horizontal nystagmus during the period of 26 seconds. The variation of 8 seconds is allowable. This constitutes the normal. A variation of more or less than 8 seconds is grounds for rejection. The test is then repeated with turning in the opposite direction.

398. EDITORIAL: *The attributes of the successful flying officer*. Lancet, No. 2: 425-26, 1918.

Vision, hearing, and the vestibular mechanism must be good. Balance and sense of position are considered more dependent on vision than on the vestibular apparatus.

399. EDITORIAL: *The Bárány tests in the examination of aviators*. J. A. M. A. 70: 1096-97, 1918.

Recent study seems to indicate the greater importance of sight in balancing.

400. FISHER, L.: *Visual factors in equilibration, especially aviation*. J. A. M. A. 70: 1625-26, 1918.

The author objected to certain statements made in Fridenberg's paper entitled "visual factors in equilibration, especially aviation" published in the Journal of the American Medical Association on April 6, 1918, page 991.

Equilibration requires a harmonious cooperation of several senses: the visual sense, muscle sense, and kinetic-static or vestibular sense (internal ear mechanism). The importance of the latter in aviation is pointed out, but the eyes also play an important role in equilibration and orientation.

One of the means for ascertaining normal acuity of vestibular perception is the rotating chair.

As a consequence of mumps, with secondary specific eighth nerve involvement, marked impairment of acuity of motion perception is sometimes observed.

Vertigo may be attributable to misinformation from visual illusions or unusual stimulations (storm clouds, etc.).

401. Fisher, L.: *The practical value of ear studies.* Med. Rec. 95: 210-11, 1919.

402. Forster, G. E.: *Information on the normal and pathologic phenomena in human flying, especially on the maintaining of equilibrium (Erfahrungen ueber normale und krankhafte Erscheinungen beim Fluge des Menschen, insbesondere ueber die Erhaltung des Gleichgewichts).* Inaug.-Diss., Breslau, 1920, pp. 47.

Regulation of balance is maintained by: (1) skin and muscles; (2) the eye; (3) the vestibular apparatus.

Muscle movements become accustomed to the requirements in the airplane, even in the most oblique positions.

Though it is easy to walk with closed eyes, the eyes are necessary for maintenance and control of equilibrium. Injuries to the eyes in flight means disaster; flying through clouds and dazzling by searchlights are the cause of accidents. Even birds cannot fly without using their eyes.

The author described the vestibular apparatus and Bárány's test and other experiments. He concluded that the vestibular apparatus does not play an important role in equilibrium.

Only the eye is reliable. Pilots flew out of clouds upside down without knowing it. But the eye is frequently subject to optical illusions which may cause giddiness.

After discussing general health conditions, the author described a test devised by Kronfeld. The pilot is placed in a dark room and attempts to photograph illuminated, quickly moving, scenery, while flak fire and optical and acoustical irritations disturb him. Tests measuring time of reaction have also been undertaken.

Normal vision is important, but pilots are allowed to wear correcting glasses.

Stereoscopic vision is not important because in high flights shadow and oblique view help to find the way though its absence may be a danger in emergency landing. One-eyed applicants can be admitted.

Color vision is important for pilot observers who must recognize color signals.

Dark adaptation is extremely important for in night flying it is necessary for the regulation of equilibrium, as well as for the recognition of targets and for landing.

Protecting glasses are essential. They must be unbreakable, must not become dimmed, and must be a protection against ultraviolet rays.

Apparatus supporting the eyes: telescope and photographic camera, and there are many apparatus helping the organs of equilibrium.

One chapter in this book described aptitude tests including color vision and reaction time tests.

403. FRIDENBERG, P.: *Visual factors in equilibration, especially aviation*, J. A. M. A. 70: 991-92, 1918.

At present the rotational tests can be carried out in less than a half hour, and vertigo, past pointing and falling, in fact, the entire labyrinthine reaction, determined and recorded. It has generally been assumed that a normal labyrinth is the *sine qua non* and the only essential for equilibration. It seems to the author that this is a one-sided point of view and that visual factors, particularly, have been overlooked. The author called attention to the practical significance of clear vision and normal ocular muscle balance. The labyrinthine tests refer to rotational vertigo alone, but faulty is the view that all vertigo is rotational and so, labyrinthine. Healthy subjects complain of dizziness due to various ocular anomalies, i.e., astigmatism, accommodation spasm and paresis, ocular motor imbalance, retinal hyperesthesia, and asthenopic strain. Faulty or ill-fitting glasses, especially prisms or cylinders, irregular illumination and motion of objects may cause dizziness. Vertigo is a disturbance or partial loss of consciousness due to incongruous reactions, whether of labyrinth, muscle-sense or vision. Our sense of balance, like our sense of space, is a conception based on complex data—an impression founded on sensory precepts, from three main sources. Confusion, evinced as dizziness or terminating in loss of balance, is the result of incongruity or misinterpretation of the total impression, though not necessarily of the falsity, however striking, of a single factor. Anderson has stated "time and again aviators coming out of dark clouds or fog have found themselves flying one wing down, and it has been recorded that some have flown upside down without knowing it. Thus it is obvious that most of the impressions which control balance in flying come through the eyes." Without vision, the labyrinth is useless as an organ for balance and sense of space.

Normal vision (20/20) is a sensible requirement. There are other factors to be considered, however. Thus the question of hypersensitiveness to bright light, the sharpness of the sense of motion—a function of the periphery of the retina that has been studied but little—the acuity of vision in lowered illumination, the appreciation of contrast in form, color, and light, all of which have an important bearing on the recognition of distant objects, especially those seen at unfamiliar angles which have no associations in shadow or relief, the rapid and accurate judgment of distance, direction, size and depending on all of these orientation in space, make an interesting and practical problem.

404. JACKSON, E.: *Vision for equilibrium and orientation*, Am. J. Ophth. 16: 412-16, 1933.

The important elements are reviewed that contribute to the recognition of relations to surrounding objects and maintain posture and equilibrium. In human beings vision, putting them in touch with objects near or far, in present or past experience, is the sense that brings the most constant and general awareness of different bodies or forces, to which

they must keep themselves adapted. The human nervous system and its coordinations are chiefly developed with reference to the sense of sight.

With perfected macular and binocular vision, the space perception it gives, and our close coordination with essential muscular actions, sight becomes the dominant factor.

Touch, muscle sense and other senses are all available to correct or supplement vision among the functions ready to assist in orientation and maintenance of equilibrium.

405. JONES, I. H.: *Equilibrium and vertigo*, Philadelphia, J. B. Lippincott & Co., 1918, pp. 459.

The following topics are included in this volume: neuro-otology; the ear and the general practitioner; the ear and aviation; the ear and seasickness; the ear in syphilis; the ear and the neurologist; the ear and the surgeon; the ear and the ophthalmologist; the internal ear and the otologist; the development of neuro-otology; anatomic and physiologic considerations of the labyrinth and the eighth nerve, medulla oblongata, pons and cerebellum, cerebellar localization; tracts of the auditory apparatus and of the vestibular apparatus, vestibular nystagmus, vestibular vertigo; pointing tests of Bárány; technic of examination of the auditory apparatus and of the vestibular apparatus; examination of a case with the use of chart, practical considerations; pathologic considerations; hypothetical cases and pathologic cases analyzed.

406. KNAPP, A.: *The role of eyes in equilibrium and orientation*, Ann. Otol., Rhin. & Laryng. 25:453-54, 1916.

Among the nervous impulses which act in preserving our equilibrium, those obtained from the eyes are mentioned as important. According to Gowers, the knowledge of the relation of external objects to the body gained from the contraction (i.e., innervation) of the eyeball muscles is one of the most important sources of guidance to the centers that regulate the muscular contractions for maintaining bodily equilibrium. Another important accessory to our sense of equilibrium is the static labyrinth. The posterior longitudinal bundle, which connects the various nuclei of the ocular muscles, is in close relationship with the vestibular nerve. The vestibular nerve thereby is closely associated with the ocular muscles, just as it is with all the muscles of the body. It serves the purpose of maintaining the muscles in a state of tonic contraction. In certain animals the position of the eyes and their movements are governed nearly exclusively by the ear. The eyes in these animals, if the head is not moved, are practically motionless. As the head moves, the eyes make a compensatory movement in the opposite direction, which originates in the labyrinth. There is constant action of the labyrinth on the ocular muscles. It holds the ocular muscles in check, giving them a definite tone, so that a lesion of one labyrinth causes a preponderance of the action of the opposite one.

The chief symptoms, so far as the eyes are concerned, which results from a lesion of the labyrinth, is nystagmus. Nystagmus, however, is a symptom which does not disturb our sense of equilibrium. In other words, those suffering from nystagmus do not complain of vertigo, unless, of course, there are other agencies which affect the center of equilibrium.

Ocular vertigo is a very unusual symptom and is difficult to explain. Vertigo occurs,

unquestionably, in ocular paralysis, owing to the confusion resulting from false projection; this, however, is a symptom which is frequently absent. Muscular anomalies, such as insufficiencies of the ocular muscles, are practically never accountable for vertigo. It is stated by some that certain errors of refraction are apt to cause vertigo, particularly in those who are suffering from astigmatism with oblique axes.

407. LEWIS, E. R.: *Visual factors in equilibration, especially aviation.* J. A. M. A. 70: 1626-28, 1918.

Fridenberg stated that the "labyrinthine tests refer, naturally, to rotational vertigo alone," and then proceeding to call attention to the fallacy of the "view that all vertigo is rotational and, therefore, labyrinthine" he evidenced a most unfortunate misapprehension of the otologic concept underlying the vestibular test. This is so simple that its soundness seems difficult to question. It is conceived that the individual selected to undergo special training as an aviator should be determined to possess normal physical equipment; his bones and muscles, cardiovascular, respiratory and gastro-intestinal apparatus should be normal; his intracranial and special sense equipment should be normal. One of the special senses to be subjected to scrutiny in this examination is the vestibular sense, the sole special function of which is perception of motion. We are in possession of information concerning the normal responses to tests of this special sense, and exactly so far as we are able to conduct such tests should we see to it that this special sense of motion perception should show as nearly a normal acuity as the special sense of light perception, which is required to show 20/20 visual acuity. One of the means of ascertaining that normal acuity of vestibular perception is present is the rotating chair. The definition of this vertigo is "the sensing of motion not in accord with fact."

The question of hypersensitiveness to bright light, sharpness of the sense of motion, especially at the periphery of the retina, photometric variations within normal limits, and a variety of other special examinations of the visual function are in process of study, and standards for the aviation services are being developed at the Medical Research Laboratory.

408. LONGSTRETH, C.M.: *Maintenance of equilibrium.* U.S. Nav. M. Bull. 27:1-9, 1929.

In aviation medicine, where we are dealing with the human body in an entirely new environment, the various senses may assume a different role. In order of importance it seems that the following special senses keep the individual informed of his space relations —namely, (1) vision, (2) muscle sense, (3) tactile sense, (4) kinetic-static sense, and (5) possible hydrostatic changes in the body tissues.

The vision, as a sense used in the maintenance of equilibrium, seems to be by far the most important to the aviator. From the time that the flier leaves the beach until he returns there is a continual demand upon his eyesight for the safe control of his ship.

When the student first starts to fly, he finds considerable difficulty in keeping the nose of the plane from climbing too high and in keeping the wings level. But as his training progresses, he learns to correct these conditions by keeping in view a certain relationship between the nose of the plane and the horizon. The importance of a definite horizon may be greatly impressed on the student if he tries to fly when there is considerable fog and a hazy horizon. Even an experienced flier will encounter much difficulty and embarrass-

ment in keeping on an even keel if the plane enters a cloud and remains out of sight of the earth and horizon. The plane may even go into a spin before the pilot becomes aware that he is failing to keep a level course. In case the flier cannot keep in touch with the earth by direct vision, it becomes necessary to do so by the use of instruments. Thus we see that the flier must at all times keep himself informed of his position in relation to the earth, either by direct vision or by the aid of his instruments.

In apparently normal individuals there is a wide range in the degree of response from the vestibular apparatus. For example, in the qualifications of a naval aviator an after-turning nystagmus of "26 seconds" duration with a variation of 10 seconds above or 12 seconds below is allowable. At present it is unknown whether the candidate for aviation training with 14 seconds duration of nystagmus as compared with the one of 36 seconds may be better or worse or no different.

It has been found in some of the experienced fliers that their nystagmus time may be decreased markedly in duration, and in some cases they may even avoid falling after turning and show no symptoms of vertigo.

It has been found that when a combat pilot comes out of a steep dive, flying at great speed, there is a temporary blurring and dimming of vision. This condition may be greatly relieved if the pilot will give a loud cry just as he comes out of the dive. In so doing he tends to prevent the pooling of blood in the splanchnic area which causes the temporary cerebral anemia. This experience is especially convincing in regard to the hydrostatic changes on the vascular system.

To summarize it would seem that equilibrium is maintained in the flier by vision, muscle sense, and possibly by the hydrostatic changes in the body tissues. The tactile sense may possibly give some information at times, but it is not to be depended on, while the kinetic-static sense can probably be considered as giving misleading information and may even be detrimental at times.

409. Neuberger, J. F.: *Medical aspects of naval aviation.* Mil. Surgeon 49:39-49, 1921.

Balance is controlled mainly through vision and the "feel" of the plane.

410. Poppen, J. R.: *Aerial equilibration.* J. Aviation Med. 5:96-106, 1934.

The three mechanisms involved in equilibration are the vestibular apparatus, the somatic sense, and vision. Although they are intimately associated, the relative importance of each is dependent on the environment conditions and requirements.

Vision is a teleoceptor. In the air the pilot must depend on vision only; the habitual equilibrating mechanism must be disregarded.

411. Prévost, G.: *A study on aviation. Modifications in the organism determined by aviation (Etude sur l'aviation. Modifications de l'organisme déterminées par l'aviation).* Paris Thèses, No. 35:1918-19, pp. 48.

The sense of equilibrium depends on the semicircular canals, vision, and the muscle sense. Loss of sense of equilibrium results from confusion of the sense of attitude of the head, trunk, and limbs. Images of "somatic" identity and of segmental attitude are carried to the

brain centers by two routes: the vestibular nerve for the cephalic segment and the nerves having origin in the deep tactile apparatus for the sense of movement of the limbs.

412. SALEM, W.: *Contribution to the interpretation of vestibular tests for aviators (Contribution à l'interpretation des examens labyrinthiques chez les aviateurs).* Presse méd. 472:1191-93, 1939.

Postrotatory nystagmus should not be interpreted by algebraic formulae.
Caloric tests were found to be the best method of examining the labyrinthine system.

413. SMALL, C. P.: *Equilibrium tests for aviation recruits.* J. A. M. A. 69:1078, 1917.

Small described the nystagmus test, pointing test, and falling test.

414. STREIT, H.: *Deviations from normal behavior in tests of the static mechanism and its consideration in the appraisal of pilots (Abweichungen vom normalen Verhalten bei Prüfungen des statischen Apparates und ihre Berücksichtigung für die Beurteilung von Flugzeugführern).* Arch f. Ohren-, Nasen- u. Kehlkopfh. 104:56-65, 1919.

The tests included are: examination of spontaneous nystagmus; walking with closed eyes backward and forward; turning about; standing on one foot; Bárány pointing test; rotation test; thermal stimulation test.
Nystagmus movements were found in 6 per cent of all cases. In four of these cases the subjects had ear trouble. Thus in normal individuals there were cases, though not many, of nystagmus movements. Spontaneous nystagmus alone is not sufficient reason to reject a candidate.

415. VAN WULFFTEN PALTHE, P. M.: *Function of the deeper sensibility and of the vestibular organs in flying.* Acta Oto-larying. 4:415-49, 1922.

Experiments were made in which the subject, blindfolded, was supposed to describe the various turns executed by the plane. The results showed that only the eyes helped to establish position.
See also: No. 342, Loy, 1930; No. 802, Flack, 1927; No. 801, Mann, 1929; No. 954, O'Reilly & MacKechnie, 1920; No. 1209, Wilmer, 1919.
See also: blind flying—spatial orientation—nystagmus.

XXXVIII. Examination Of The Eye

A. ACCOMMODATION

416. BURNS, C.: *An accommodation ergograph.* Tr. Am. Acad. Ophth. 1929, p. 472.

An ergograph is described for graphically recording the behavior of the near points of accommodation and convergence which has aided in the differential diagnosis of asthenopia. It affords a means of observing progress and stimulates the interest and cooperation of patients in general medical and orthoptic treatment.

417. BLATT, N.: *Weakness of accommodation.* Arch. Ophth. 5:362, 1931.

Blatt suggested an accommodometer for more accurate determination of the near point. He stated that the test for the near point ordinarily employed does not rule out cases with weakness of accommodation. This weakness can only be demonstrated by repeated trials.

418. DASHEVSKIY, A. I.: *Method for differential diagnosis of muscular and accommodative asthenopia.* Vestnik oftal. 16:156, 1940.

The author aimed at a differential diagnosis of accommodative and muscular asthenopia. The test for accommodative asthenopia is based on the concave lenses which accommodation can overcome. The state of convergence is measured by the amount of base-in prism which can be overcome and held for five minutes. Charting of the accommodation and convergence for a period of five minutes gives a graphic record of these functions. Treatment consists in orthoptic training of the ciliary muscles or internal recti as the case indicates.

419. GREENE, R.: *Improved device for Prince rule.* J. Aviation Med. 9:120, 1938.

A modification of the standard Prince rule, as developed in the medical department of the Eastern Air Lines, is illustrated. In estimating the angle of convergence, the chances for error, due to shifting of the white-headed pin, held in the hands of the examiner, are evident.

A rubber shoe has been provided to act as a brake against the edge of the rule and insure fixation and avoid accidental shifting. When the handles are compressed, the rubber brake is lifted in order that the bracket may move easily. When pressure on the handles is removed, the bracket is locked in a stationary position. The pin, fitted into a groove, may be adjusted to a standard position and is removable. The position of the rule may be reversed in the examination of each eye, separately, for determining accommodative powers. The examinee may be permitted to manipulate the device for measuring accommodation; handing the rule to the examiner for reading.

The basic idea for this refinement should be credited to the Navy Medical Corps. Their device consisted of a modified clamp to which a white-headed pin is soldered. A clamp may become loosely fitted from wear, or too snugly fitted if the rule swells from dampness. The use of four rollers and a braking device seems to work more satisfactorily and will compensate itself for the effects of wear. The painted figures on a standard Prince rule may become defaced. A metal rule constructed of dural, with the figures stamped thereon, would be more durable and would lend itself more satisfactorily to the use of rollers as illustrated.

420. HOWARD, H. J.: *A new apparatus for testing accommodation.* Air Serv. Inform. Circ. 1 (99):86-89, 1920.

The test for the near point of accommodation produces results subject to greatest variations. The discrepancies are caused by difference in size of test objects and speed of approach; difference in illumination and legibility of letters; difference in the place of con-

tact and the angle of the measuring rule; in the position from which the reading is computed; and in the personal equation of the examiners and (which is the most important) of the subject. The recession and the approximation methods are discussed.

Howard devised an apparatus consisting of a hood which covers one eye and has an opening for the other eye. There is a box on a grooved rule. As the box moves on, the rule test objects appear at a window in the front of the box as well as at the back of the box so that the test objects may be verified by the examiner. The recession or objective method of testing is employed, i.e., the box is very close to the eye and then is moved backward until the test object is legible. The bulge of the hood should fit tightly against the malar bone when the rule is held in horizontal position. The average distance from this bone at a point directly below the pupil to a perpendicular line drawn tangent to the cornea is 6 mm. Since all measurements of accommodation should be made from the anterior focus, being 11.5 mm. in front of the cornea, zero on the scale must be at 17.5 mm. in front of the facial end of the rule, the right side of which is marked off in diopters and fifth of diopters. As the barrel contained in the box rotates, letters appear in succession before the window in the box. The test carrier must be started as close to the eye as possible and pushed slowly away until the subject is first able to read the letter (or distinguish correctly the position). The examiner is able to verify the statements because the letters which each of them sees occur in the same series.

421. Kirchhof, H.: *Method for objective measurement of accommodation speed of the human eye; effects of fatigue, physostigmine, pilocarpine and homatropine on accommodation* (*Eine Methode zur objectiven Messung der Akkommodations deschwindigkeit des menschlichen Auges. Die Akkommodations deschwindigkeit und ihre Beeinflussung durch Ermüdung, Eserin, Pilokarpin und Homatropin*), Ztschr. f. Biol. 100:408-20, 1940.

The author described the earlier methods used in measuring the rate of accommodation, but since they do not make objective measurement of the accommodative rate possible, he worked out another approach. The new method permits the photographic registration of the changes in size, which the so-called Purkinje-Sanson lens pictures undergo in the process of accommodation.

The accommodative rate is not a constant quantity but is dependent on the will and the concentration. Even when the subject makes an effort to accommodate as quickly as possible, considerable differences in time are noted in various accommodative procedures. Average values from a number of series of measurement were used for purposes of comparison. Slight daily variations and individual differences up to 39 per cent were observed. The accommodative rate from far to near averaged 15 per cent lower than that from near to far, the average for far to near was 0.5 second and that for near to far 0.426 second. In incomplete utilization of accommodation range the accommodative rate increases. It was found that slight changes in distance from the eye necessitated great changes in the refraction capacity of the lens; this was shown by corresponding changes in accommodative rate and considerable changes in size of the lens pictures. In fatigue of the ciliary muscle the accommodation time for far to near was increased as much as 36 per cent of the rest value. The accommodation time for near to far was practically unchanged.

Several examples of pharmacologic effect upon the accommodation rate are given. Eserine, which in proper dose induces accommodation cramp in fixation on a near point, increases the accommodation time for near to far to four seconds. The far to near time was shortened only a little. Pilocarpine has a similar action, only weaker and of shorter duration. Homatropine, which induces accommodation paralysis when administered in large doses, reduces the accommodation rate for far to near to a considerable degree when given in smaller dose or when the result is read prior to the time when paralysis is complete. The fact that the accommodation time for near to far is also increased must be explained on the basis of contracture of the ciliary muscle during the relaxing time. Comparison of the original curves with the rest curve showed that eserine reduces the accommodation rate for near to far especially in the region of adjustment of the lens to great distance, while homatropine for far to near increasingly slows down the form changes in the lens as it approaches near point adjustment. This method should be used only in the examination of individuals under 25, because after that age so-called nuclear formations develop at the edge of the lens and its nucleus, making accurate measurement impossible. These examinations are especially valuable in the determination of efficiency of flight pilots.

See also: No. 64, Ferree, Rand and Lewis, 1935.

1. Speed of Adjustment

422. Banister, H. and Pollock, K. G.: *The accommodation time of the eye.* Brit. J. Psychol. 19:394-96, 1928-29.

An apparatus has been designed to give a tachistoscopic exposure of letters at different distances from the eye, the time interval between the exposures being variable.

The results so far obtained are tentative. They relate to monocular vision with three subjects, each of whom in respect to visual acuity was above normal as tested by Snellen's type. They indicate considerable differences between individuals besides the usual diurnal variations in the same subject. Age appears to slow the accommmodation time, while quick accommodation time may go with goodness at ball games.

423. Ferree, C. E. and Rand, G.: *An instrument for measuring dynamic speed of vision, speed of accommodation and ocular fatigue.* Arch. Ophth. 15:1072-87, 1936.

The instrument is a compound rotary tachistoscope comprising a driving mechanism, four sectored disks so arranged and of such sizes as to expose in immediate succession, in turning, a near test object on the left, a far test object in the median plane and a near test object on the right. The test objects are the letter E.

The following practical uses of the instrument and test are discussed: (1) as a means of detecting abnormalities and depressions in the oculomotor functions in the work of the clinic; (2) a test for vocational fitness in all cases in which dynamic speed of vision is an important requirement; (3) as a limiting test for age; (4) as a means of measuring ocular and oculomotor fatigue and recovery and of testing individual susceptibility to ocular fatigue and the capacity to recover; (5) as a means of training eyes to greater oculomotor and accommodative facility.

424. Ferree, C. E. and Rand, G.: *A multiple exposure tachistoscope.* J. Exper. Psychol. 21:240-59, 1937.

The instrument described is a multiple-exposure rotary tachistoscope (see No. 423). The test objects are the letter E, the openings of which can be turned in eight different directions to give an objective check on the judgment. The far test object is provided with a remote control so that these adjustments can be made by pressing an electric key at the position of the examiner. The distance of the far test surface and the lateral separation of the two near test surfaces can be varied at will. The sectored disks are turned by means of a motor of constant speed provided with gears to give suitable reductions in speed and an intermittent gear which causes the disk covering the test objects prior to the beginning of the exposure to stop in exactly the same position at the end of a single rotation. In the preferred form the values of open sector are adjusted by small worm-gears, which serve to change the position of the movable disks and to hold them firmly in position for any given setting. Exposure may be made in continuous series up to four seconds. Both the angular values of open sector and the times of exposure can be read from suitably positioned graduated scales.

The instrument makes possible: (1) the use of a set of very sensitive tests which take into account as no other tests do the motor and the sensory functions of the eyes in just the proportion that they occur in the act of seeing objects in different directions and at different distances, (2) the testing of the dynamic speed of vision with either the oculomotor or the accommodative feature emphasized, and (3) the measurement of the time required to change from near to far and from far to near in combination or separately.

425. Ferree, C. E. and Rand, G.: *An instrument for testing pilot fitness.* J. Aviation Med. 10:114-28, 1939.

Sensitive tests of fitness and disturbances in fitness are proposed and a convenient instrument for giving these is briefly described. This instrument is an electrical multiple-exposure tachistoscope (see No. 423 and No. 424), comprising a timing mechanism and three shutters electrically operated. The test objects, which are the letter E, may be rotated in four different positions.

The far test object is mounted in the same cabinet which contains the near test objects, the shutters and the timing mechanism. A front-surfaced mirror which is mounted at an appropriate distance from the rear of the cabinet serves to reflect into the viewing slit the image of the far test object, thus reducing floor space requirements. The distance of the far test object, the lateral separation of the two near test objects and the illumination of all three can be varied at will. The exposure time of each of the shutters is controlled through the setting of the appropriate pointers of the timing dial. The total duration of all the exposures can be varied from two to ten seconds. At these limiting ranges the divisions on the dial equal respectively, .004 and .02 second. If still longer exposure times should be required, this can be arranged for in the reduction gearing of the motor operating the timing mechanism.

In addition to the uses of this instrument listed in abstracts No. 423 and 424, the following are suggested: (1) a test of pilot fitness for aviation; (2) a specific preformance test of fitness for night flying; (3) a test of disturbance in fitness due to altitude; (4) a means of detecting disturbances in fitness from loss of sleep, worry and all mental states that distract attention, etc.

426. Ono, K.: *Investigation concerning the accommodation time of the eye in the marine flier (Untersuchung über die Akkomodationszeit am Auge des Marineflieger)*. Bull. Nav. M. A., Japan 29 (11): 751-75 (Japanese text); 57 (German text), 1940.

The author made a study of the accommodation, relaxation, and reaction time in 1,000 emmetropic marine fliers and marine soldiers whose eyes were healthy. These men ranged in age between 19 and 34 years. A study was also made of the effect of instillation of several vegetative nerve toxins. The chief findings may be summarized as follows: (1) The older the individual, especially the marine flier, the longer will be the accommodation and relaxation time; (2) by practice the speed of accommodation and relaxation may be increased to a certain degree, but it is difficult to achieve this speed in the presence of overexertion of the body; (3) for increasing this speed the instillation of pilocarpine is more effective than the administration of the other nerve toxins.

See also: Accommodation—speed of adjustment.

See also: No. *51*, Ferree & Rand, 1918; No. *54*, Ferree & Rand, 1937; No. *475*, Wilmer & Berens, 1920.

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ABSTRACTS

ophthalmology

OPTICS, PHYSIOLOGY AND PSYCHOLOGY OF VISION

A Study of the Flattening Effect Produced by Optical Magnification. S. HOWARD BARTLEY, E. Lansing, Mich. Am. J. Optom. & Arch. Am. Acad. Optom. *28*:290-99, June 1951.

It has been known in an informal way by some that instrumental magnification reduces the appreciation of third dimension, particularly as applied to solid forms. Although this observation has not been systematically investigated, the principle was recently investigated by Miller and Bartley, as it applied to tilted two-dimensional objects, and found to hold. In the present article the principle was reported on as it applied to three-dimensional forms that could be manipulated in shape so as to determine the shapes necessary for perceiving them as rectilinear. A discussion of some of the general principles of human perception was included to provide a basis for understanding the experimental results.—*Author's abstract.*

PHYSIOLOGY, CHEMISTRY AND BIOCHEMISTRY OF THE EYE

Effects of Repeated Pre-Testing With Conditioned Stimulus Upon Extinction of the Conditioned Eyelid Response to Light. DAVID A. GRANT, HAROLD W. HAKE, ARTHUR J. RIOPELLE, AND ALBERT KOSTLAN, Madison, Wis. Am. J. Psychol. *64*:247-51, April 1951.

Resistance to extinction frequently has been used as a measure of strength of conditioning because of its superiority to magnitude measures of the conditioned response which often reflect response strength rather than strength of conditioning. Estimates of the strength of an associative bond based on extinction trials also break down, however, whenever there is a departure from 100 per cent uniform reinforcement during acquisition or conditioning trials. Pretesting with the conditioned stimulus, before acquisition trials are begun, is a common procedure and represents a departure from 100 per cent reinforcement. In a previous experiment an inversion of the extinction curve was observed following a single pretest with the conditioned stimulus. The present investigation extended the study of this effect.

Acquisition and extinction curves of human eyelid conditioning were compared in three groups of 20 subjects each. One group received a 10-trial pretest with the conditioned stimulus (light) alone on each of the first three daily sessions. Another group received a 5 trial pretest at this time, and the third group was given no

pretest. Following these procedures each day, all groups received 20 reinforced trials. The unconditioned stimulus was a corneal air puff. On the fourth day all groups received a 25-trial extinction series.

Inversions occurred in the extinction curves of the pretested groups. The inversions were not statistically significant, but the higher level of response during extinction found in 10-trial pretest group was shown to be highly significant by an analysis of variance. 10 references, 1 figure, 1 table.—*Author's abstract.*

DIAGNOSTIC METHODS OF EXAMINATION, BIOMICROSCOPY AND PHOTOGRAPHY

The Use of a Dental Mouth Mirror to Inspect the Conjunctiva. CHARLES C. TURNER. Cleveland, Ohio. Am. J. Optometry *28*:241, May 1951.

In routine eye work on eof the most unpleasant procedures for the patient is the inspection of the superior palpebral conjunctiva. This procedure is often omitted because it is awkward for the doctor and uncomfortable for the patient. For these reasons some mechanical device for inspecting the upper lid area without eversion would appear to have some value.

The use of a regular plano dental mouth mirror with good overhead illumination solves many of the problems. The hand, holding the mirror, is placed against the temporal region of the patient's head for support. The edge of the mirror is held against the skin just above the inferior orbital margin; the upper lid is then pulled directly forward. The conjunctiva and formix thus exposed are inspected with the aid of the mirror.—*Author's abstract.*

OCULAR MOVEMENTS AND MOTOR ANOMALIES, NYSTAGMUS, READING DISABILITY

The Relationship of Proximal Convergence to Fusional and Accommodative Convergence. HENRY W. HOFSTETTER. Los Angeles, Calif. Am. J. Optom. & Arch. Am. Acad. Optom. *28*:300-08, June 1951.

Measurements of the lateral phorias and the base-out and base-in prism limits of clear single binocular vision were made on 21 adult subjects, with varying amounts of dioptric stimulus to accommodation and at two different test chart distances (33.3 cm. and 6 M.) The subjects were continuously aware of the actual distance of the test charts.

Analysis of the data indicates that the differences in actual, and therefore perceived, distance of the test chart induced convergence responses independent of the responses attributable to changes in accommodation. The induced convergence, identified as proximal convergence, was least apparent in the base-in prism findings and most pronounced in the base-out prism findings. This was interpreted to mean that proximal convergence is closely associated with the amount of fusional convergence in play. However, there was no correlation between the total range of fusional con-

vergence possible and the proximal convergence manifested in the individual subjects. This was interpreted to mean that proximal convergence and fusional convergence have independent neurologic origins.

In the 21 cases studied, there was no significant correlation between the A.C.A. ratios and the amounts of proximal convergence manifested.—*Author's abstract.*

Esotropia, Incidence, Etiology, and Results of Therapy. RICHARD G. SCOBEE. Am. J. Ophth. *34*:817-33, June 1951.

In a series of 558 consecutive heterotropia cases, the author found a predominance of esotropia (82 per cent). It was possible to give adequate treatment and get an accurate follow-up in 238 patients. All forms of therapy except formal orthoptics were given, and 56.7 per cent attained fusion.

The methods employed in obtaining these results are given in detail. These include: history; refraction; full correction of ametropia; occlusion; preoperative measures; surgery; and compilation of data. The latter shows several interesting points, some of which are that: 19 per cent of the cases were nonaccommodative; 66 per cent were partly accommodative and 15 per cent were purely accommodative; a higher incidence (28 per cent) of esotropia was found at birth than at any other age; 69 per cent of the cases occluded because of suppression amblyopia obtained visual acuity of 20/40 or better.

The author mentions that, at the time his study was being conducted, no formal orthoptics were available. He states that this lack of orthoptics was a definite disadvantage to the patients, but a subsequent paper will deal with a series of similar size in which orthoptics were utilized to the utmost. Comparison of results in the two studies should prove to be of considerable interest to those concerned with the treatment of heterotropia and should be of particular interest with respect to the value of orthoptics.

The Problem of the Poor Reader. ARTHUR JAMPOLSKY, San Francisco, Calif. Digest of Ophth. & Otol. *13*:538-42, July 1951.

This paper which appeared originally in *California Medicine*, April 1951, divides poor readers into two groups: those who have a specific reading disability and those in whom the disability is nonspecific. The former is caused by a confusion in the recognition of language symbols, and it is usually associated with ambidexterity, comparative clumsiness, and an exaggerated persistence of the normal childhood tendency to reversal of letters and symbols.

In the nonspecific group the lack of progress in reading may be due to low intelligence, lack of interest, insufficient readiness to read, ocular anomalies, hearing defects, emotional problems, and other obstacles to learning. It is important to recognize specific reading disability early since then more direct attention may be given on the reading problem and alternative methods of teaching may be used. However, if the child is found not to have a specific reading disability, consultants must determine which of the factors mentioned require attention. In cases of nonspecific reading dis-

ability, the emphasis should be placed on an investigation of the physical and emotional obstacles.

Prophylactic measures may be carried out in the field of reading problems in purest and simplest form by combining phonetic, kinesthetic, and visual methods in the teaching of reading skills.

Retinal Correspondence in Patients with Small Degree Strabismus. ARTHUR JAMPOLSKY. Arch. Ophth. *45*:18-26, Jan. 1951.

Of 84 patients with esotropia of less than 15 degrees, 92 per cent demonstrated anomalous retinal correspondence on the major amblyoscope when the conditions of testing were adapted to the measurement of the small angle of anomaly. These findings were confirmed by alternative methods, such as, the red glass diplopia test, the Maddox test, and the Tschermak after-image test.

Besides the high incidence of anomalous retinal correspondence and anomalous peripheral fusion in these small angle esotropic cases, there is also a slight amblyopia of the deviating eye with foveal or macular suppression. Orthoptic training usually fails in these cases, and the author believes this point needs emphasis because orthoptic treatment is given frequently for eyes that are "almost straight" when the sensorial conditions have been misinterpreted.

Post-Operative Orthoptic Cure in a Case of Right Convergent Squint with Amblyopia and Nystagmus. AGNES SUTTON AUSTIN. Miami, Fla. Am. J. Optom. & Arch. Am. Acad. Optom. *25*:417-20, Aug. 1951.

Description and sequence of office procedures and home training technics used in directing the progress of a case of postoperative, right convergent squint, with amblyopia and nystagmus, in a $4\frac{1}{2}$ year old patient, stressed the importance of improvement of complete body coordination before, and concurrent with, specific eye coordination training.

While great improvement in posture (of both body and eyes), in performance, in behavior, in personality, and in achievement were evidenced, only relatively small change was measurable in test findings after 65 hours of office training.

Continuation of training in both body and eye coordination was recommended. *Author's abstract.*

ANOMALIES OF REFRACTION AND ACCOMMODATION, CONTACT LENSES

Accommodation and Convergence in a Patient with Adie's Pupil. MEREDITH W. MORGAN, JR. AND R. F. HARRIGAN. Berkeley, Calif. Am. J. Optom. & Arch. Am. Acad. Optom. *28*:242-53, June 1951.

Clinical and haploscopic measurements of various visual functions were made on a patient with the Adie pupil syndrome. There was a marked reduction of the ampli-

tude of accommodation on the affected side as well as the usual dilated static pupil with respect to the light reflexes.

The accommodative-convergence mediated by the affected eye was higher (13.5Δ/1.00 D) than that mediated by the normal eye (4Δ/1.00 D) in the ratio of 3.4 to 1.0. The difference in accommodative amplitudes was 8.50 D to 2.75 D or a 3.1 to 1.0 ratio. The total convergence mediated by a maximum response of accommodation was also determined; it was found to be 29Δ for the normal eye and 30Δ for the affected eye.

The following conclusions seem warranted on the basis of the above data and known neuro-anatomy: (1) The lesion in the Adie pupil syndrome is between the III nerve nucleus and the eye. (2) Accommodative-convergence involves a relationship at the third nerve nucleus. (3) In this patient, at least, there is little or no physiologic accommodative reserve.—*Authors' Abstract.*

Trifocal Lenses. A Clinical Study Based Upon 22,640 Trifocal Prescriptions. ROBERT E. BANNON. Hanover, New Hampshire. Am. J. Optometry. *28*:254-74. May 1951.

In an attempt to determine the current practices of prescribing trifocal corrections, a questionnaire consisting of 16 questions was sent to 200 practitioners (ophthalmologists and optometrists) who had had considerable experience with this type of correction. Replies were received from 153 men, representing a total of 22,640 trifocal prescriptions over a five year period.

Following an introduction covering the historical aspects of trifocals and a brief resume of the theoretical considerations involved in the prescribing of trifocals, the practical (clinical) data resulting from the replies to the questionnaires are presented and discussed. In general, the practitioners agreed that the most significant factors in prescribing trifocals were the needs of the patient, i.e., his intermediate working distance, and his complaints—symptoms of discomfort and/or inefficiency. The replies indicated that it was an easy matter to prescribe and fit trifocals successfully.

The summary of the replies indicated that complete success was obtained in 92 per cent of the cases; in 7 per cent, partial success was reported, and only 1 per cent of the classes were classed as failures. The replies to other questions indicated some of the difficulties encountered in prescribing trifocals and included suggestions as to how these difficulties might be overcome; how the improved intermediate vision affected the patients' comfort and efficiency at work; how the practitioners indoctrinated their patients relative to their new corrections, and also included the practitioners' suggestions for better service to patients. In this latter category it was mentioned that a trifocal fitting set was very helpful, and there were several suggestions for a different name for trifocals to avoid "the badge of old age." These suggestions included such names as: three way vision lenses, youthful vision lenses, and continuous vision lenses. The value of careful case histories was stressed repeatedly by the practitioners replying to the questionnaires.

In the final section the experiences of several individual practitioners are presented. These resulted from additional comments which various practitioners made on the questionnaires and from interviews. 12 references. 2 figures.—*Author's abstract.*

CONJUNCTIVA

Epidemic Keratoconjunctivitis. H. L. ORMSBY. Canada. Ontario Med. Rev. *18*:23-24, Sept. 1951.

An outbreak of epidemic keratoconjunctivitis has occurred at an industrial plant employing 12,000 men at Windsor, Ontario. There have been more than 600 cases.

The agent is a virus of about 50 millimicrous size. It is sometimes transferred in butyn or fluorescein drops used by an ophthalmologist. The incubation period is nine days. Lacrimation and photophobia are the first symptoms. Cultures are negative, scrapings contain lymphocytes. The preauricular gland is enlarged early in the disease. Follicles in the conjunctival fornices and multiple, deep, round, corneal infiltrates occur later.

Spread is by direct and indirect contact, including the doctor's eye drops. Patients can be sent home from work, sanitary precautions can be undertaken, or a plant can be shut down completely.

Pterygia—Etiologic Theories, Methods of Treatment, and Results. R.E. BARTLETT AND C. S. MUMMA. Los Angeles, Calif. California Med. *74*:263-66. April 1951.

Although it has been postulated that a pterygium develops from the ordinary pinguecula, which is a phenomenon of aging, the average age of patients in a Veterans Administration hospital who were operated upon for removal of pterygia was 34.9 years. Mexicans appeared to be particularly susceptible to the disease. Analysis of the literature and review of observations in the present series of cases indicated that long continued exposure to the elements, particularly the sun's rays, is a prime etiologic factor and that dust and other irritants are of less importance.

In a study of 285 patients who had pterygia, no correlation of this disease with other local or general disease was observed.

An operation which brings previously unexposed conjunctiva into the area, from which a pterygium is removed, and which does not bury the epithelium was used successfully. 16 references, 1 figure.—*Author's abstract.*

RETINA

Colour Vision of Baganda Africans. KURT SIMON, Leipzig, Germany, F.B.O.A. London, England. E. African Med. J. *28*:75-79, Feb. 1951.

Five hundred and thirty-seven male Bagandas were examined for color blindness. It was found that 1.86 per cent were red green color blind; there were no cases of yellow blue or complete color blindness.

The color sense of the African cannot be assessed by the poverty of color nomenclature in his language.

Vagueness of color terms and confusion of colors is due to the fact that brightness and saturation is psychologically more important to primitive man than tone or hue of color. 12 references.

NEURO-OPHTHALMOLOGY, OPTIC NERVE, VISUAL PATHWAYS, CENTERS AND VISUAL FIELDS

Tumours of the Brain, Occipital Lobe; Their Signs and Symptoms. CRAIG D. PARKINSON, Toronto, Canada. Canad. M.A.J. *64*:111-13, Feb. 1951.

The basis of this study is 50 verified tumors which did not extend beyond the occipital lobe.

The symptoms, in order of frequency, were: headache, 90 per cent; nausea and vomiting, 46 per cent; defect of visual field, 38 per cent; failing visual acuity, 32 per cent; ataxia, 30 per cent; hallucinations, 24 per cent; and diplopia, 12 per cent. The loss of visual field was of the negative type, not being apparent as a black curtain to the patient.

The signs, in order of frequency, were: defect of field, 86 per cent; papilloedema, 70 per cent; cerebellar signs, 40 per cent; weakness of the face or extremities, 26 per cent; aphasia, alexia, visual agnosia and agraphia, 4 per cent each; sixth nerve palsy, 6 per cent; inactive pupils and paresis of accommodation, 2 per cent each. Congruity of the visual fields and macular sparing were present in 70 per cent.

Careful perimetric studies are by far the best method of localizing occipital lobe tumors. 6 references.

LACRIMAL APPARATUS

A Case of Mikulicz's Disease. L. S. MAUTNER, Canada. Bull. Acad. Med., Toronto *24*:76-80, Feb. 1951.

A woman suffered from a lymphoid hyperplasia, and some chronic inflammatory change, beginning in the right parotid gland and involving the right lachrymal gland, over a period of 15 years. 9 references.

ORBIT

Venous Aneurysms of the Orbit. R. E. TEITGEN AND W. L. BENEDICT, Cincinnati, Ohio. Am. J. Ophth. *34*:94-98, Jan. 1951.

Significant alterations in the orbital veins, whether congenital or the results of pathologic degeneration of the vascular walls, neoplasms or trauma, give rise to venous aneurysms.

Venous aneurysms without direct arterial connection give rise to intermittent, progressive, or recurrent exophthalmos. Proptosis appearing or increasing when the head is bent forward or when the jugular veins are compressed is called intermittent exophthalmos.

Sometimes exophthalmos is variable in extent and is accompanied by recurring increase of proptosis associated with ecchymosis of the lids. Such episodes are caused by thrombosis within the aneurysm and are of diagnostic significance.

Virchow ascribed hemangiomas to irritation of highly vascular free edges. Parsons

thought they are always congenital. Duke-Elder described them as developmental in origin, the predisposing condition being present at birth.

Nine cases of venous aneurysm have been reviewed. The ages of onset were all less than 35 years, and 8 were less than 25 years. Two cases illustrated intermittent exophthalmos and 1, both intermittent and recurrent types. Four cases illustrated recurrent exophthalmos, and one both recurrent and permanent types. One case was purely of the permanent type of exophthalmos.

Surgical treatment was attempted in 5 of the cases with no improvement in 2 cases. The primary surgical difficulties seemed to be bleeding and collapse of the tumors. The transcranial as well as the orbital approach to the tumors was used in different cases. There was roentgen-ray treatment of one case and improvement followed.

Of the 9 cases, only 2 are known to have had impaired vision in the involved eye. 10 references. *Author's abstract.*

ANESTHESIA

Intravenous Morphine in Ocular Surgery. E. A. JOHNSON. Canada. Canad. M. A. J. *64*:429-33. May 1951.

The solution to be injected consists of morphine sulfate grains $\frac{1}{4}$, scopolamine grains 1/200, ephedrine sulfate grains 1/6, to each 4 cc. of $\frac{1}{2}$ per cent chlorobutanol. The solution is filtered through an ultrafine glass suction filter, put in rubber capped vials, and sterilized at 120 C for 17 minutes.

When administering 3-4 cc. are drawn into the syringe. It is given in the operating room before the local nerve blocks. Sodium amytal, grains 3, has been given two hours previously. The solution is injected, intravenously, at the rate of 1 cc. per two minutes. While this is being done, the surgeon can be scrubbing and giving the local nerve blocks. The maximum depressant effect from the morphine occurs in about 7-10 minutes, the maximum psychic sedation begins in 10 minutes, and the maximum analgesic effect takes place in 20 minutes.

Possible complications are bronchial muscle spasm, increase of vascular hypertension due to the ephedrine, and tachycardia due to the ephedrine and scopolamine.

This type of anesthesia was used on 101 patients, 77 intraocular operations, and 24 extraocular operations. There was a striking absence of severe side effects. Two patients noticed dizziness, tachycardia was noticed in 25 per cent of the patients, and slight cyanosis was noted in 3 patients. Postoperatively, 6 patients noted headache, 10 patients were nauseated, 4, vomiting. Mild postoperative excitement was shown by 3 patients.

MEDICAL OPHTHALMOLOGY

Fundus Changes in Leukemia. ARTHUR M. CULLER. Columbus, Ohio. Am. Ophth. Soc., 1951.

Retinal hemorrhages were seen in 48 per cent of 144 cases of leukemia. Hemorrhages

into other tissues are common in leukemia, usually due to anemia, hypoprothrombinemia or thrombocytopenia. Hemorrhages due to anemia do occur in the fundus, but this factor seemed to be correlated only when the count was below two million red cells per cubic millimeter in this series. There was no correlation between the prothrombin level and retinal hemorrhages. One hundred and sixteen of the 144 patients showed a low platelet count; this is obviously a characteristic of the disease. Seven out of 28 patients, with a high platelet count, showed retinal hemorrhages.

A histologic study of autopsy material revealed that there were more white blood cells in the retinal vessels than in the peripheral circulation elsewhere. This occurred whether the white cells were increased or diminished in the rest of the body. The accumulation of white cells occurred along the walls of the vessels. This would produce a slowing of the circulation. The intraocular pressure might contribute to stasis in the retinal vessels.

Leukocytic infiltration of the retina was common, and leukemic retinopathy may be interpreted as a leukemic infiltration aggravated by the high tissue pressure, rather than as a disturbance of the other elements of the blood such as causes hemorrhages into other tissues.

The Ophthalmologic Aspects of Chronic Renal Disease. ROBERT W. HOLLENHORST, Rochester. Minn. Med. Clin. North America 35:1023-39, July 1951.

The most characteristic retinal picture of chronic renal disease is angiospasm and acute hypertensive retinopathy or neuroretinopathy with anemia. Each appears only when the peripheral diastolic blood pressure is elevated to a pathologic degree, and then the retinal changes are approximately proportionate in degree to the height of the blood pressure. The retinal changes are independent of the existence of azotemia.

The retinopathy of chronic renal disease in many cases may be distinguished from that of malignant hypertension by the presence of anemia, and the absence of, or minimal degree of, retinal arteriolosclerosis. In retinopathy associated with chronic renal disease, considerable edema of the retina is seen, while this is less evident in malignant hypertension.

In chronic renal disease toxic or anemic retinopathy may be present alone or combined with acute angiospastic retinopathy.

Toxic retinopathy may be present in cases of acute, subacute, and chronic glomerulonephritis, periarteritis nodosa, and disseminated lupus erythematosus, even in the absence of hypertension.

Periodic examination of the retinal arterioles is of importance in the observation of patients having these diseases, since the presence of considerable angiospasm gives an indication of the imminent onset of retinopathy and consequent entry into a severe phase of the disease.

The mean life expectancy in cases of chronic glomerulonephritis in which retinopathy is present is about four to six months as compared to about 13 months in malignant hypertension. Although patients who had the former have survived as long as 23 months and those who had the latter, up to 12 years.

Acute hypertensive retinopathy occurring in chronic glomerulonephritis, periarteri-

tis nodosa, and disseminated lupus erythematosus is evidence of entry into the terminal phases of these diseases and indicates involvement of the renal arterioles. 35 references.—*Author's abstract.*

Oculoglandular Tularemia Transmitted from Contaminated Sewer Water. W. R. S. LINDSAY AND J. W. SCOTT. Edmonton, Canada. Canad. J. Pub. Health *42*:146-51, April 1951.

Some sewage spilled in the right eye of a workman. The next day the eyelids were swollen, red, and painful. On the fourth day of his illness he was found to have a fever. There was a swelling of the right parotid and submaxillary glands. On the fourteenth day blood agglutination to *P. tularensis* was positive to a 1/800 dilution. Guinea pigs inoculated with blood from the workman later showed agglutinations for *P. tularensis* up to 1/1600. Cultures of the workman's blood were negative. The fever responded rapidly to treatment with streptomycin and aureomycin.

This is one of the first instances of oculoglandular tularemia resulting from contaminated water. In the "great plains" of southern Alberta the opportunities for contamination of surface water by *P. tularensis* are great. Chlorination of water is effective against *P. tularensis*. 25 references.

PHARMACOLOGY, TOXICOLOGY AND THERAPEUTICS

Cortisone in Eye Disease. R.A. TROPE, South Africa. *D.O.M.S., R.C.P.&S.* (Eng) South African M. J. *25*:349-50, May 1951.

Three cases of eye disease, where the prognosis was very poor, were treated with cortisone with excellent results.

CASE 1: A European female patient, aged 30, with a previous history of corneal ulcers during childhood, developed a dendritic ulcer of the right cornea. In spite of usual treatment, within three days she was suffering from acute iridocyclitis with fully developed secondary glaucoma.

Treatment with cortisone was instituted: (1) Two intramuscular injections of 1 cc. of cortisone (each containing 25 mg.) were given at eight hourly intervals; then once after 12 hours and subsequently once daily by mouth. (2) An 0.5 per cent solution of cortisone was instilled into the right conjunctival sac at intervals of one hour.

This was given in addition to the other usual treatment which the patient was receiving.

Within three days the condition had practically resolved, and a week later the eye was normal.

CASE 2: A male, aged 55, with acute iridocyclitis with hypopyon in an aphakic eye, was treated with cortisone drops hourly. Within five days the condition had completely cleared up.

CASE 3: A male, aged 35, with previous lime burns in the left eye, suffered from persistent intractable corneal vascularization around the whole limbus. Hourly instillation of cortisone eye drops for one day resulted in resolution of the condition within three days.

It appears that in these cases local administration of cortisone had the most marked effect. This drug penetrates the cornea to act directly on the uveal tract. There was no effect on the size of the pupil when a mydriatic drug was not used. 3 tables.—*Author's abstract.*

Cortisone in the Eye. London, England. Brit. M. J. 1313-14, June 9, 1951.

The ophthalmic surgeon is favorably situated in his study of the effects of substances which are reputed in some way to modify or control the phenomena of ocular inflammation, since he can from day to day see precisely what is happening. Furthermore, there is by now considerable evidence that the local use of cortisone in small quantities, either by subconjunctival injection or even as collyria, is as effective in many ocular diseases as its systemic administration in much larger doses. His use of the drug, therefore, is not only economical but also free from undesired side effects.

In the past year a sufficient number of papers have been published to allow some preliminary assessment of the place of cortisone and ACTH in the oculist's therapeutic armamentarium. Perhaps the most important experimental work is that of Alan Woods, of Baltimore, who has shown that in rabbits ACTH given systemically, and cortisone systemically or locally, block in the eye the inflammatory and exudative phases of an anaphylactic protein reaction, of a bacterial allergic reaction, and of the focal reaction produced by the subcutaneous injection of tuberculin; while cortisone used topically or systemically blocks the inflammatory reaction caused by glycerin or jequirity infusion injected into the anterior chamber. Woods emphasizes an important point confirmed by Biegel in work on horse serum uveitis in rabbits that neither cortisone nor ACTH has any effect on any underlying hypersensitive state which may be present, and that, even after their prolonged administration, once they are withdrawn hypersensitive ocular tissues will react in the usual manner if contact with the specific antigen is reestablished.

The inferences which may be drawn from this are borne out to a large extent both by the clinical results, sometimes conflicting, so far published.

Very encouraging results have been reported in the treatment of such self-limiting ocular diseases as congenital syphilitic interstitial keratitis and sympathetic ophthalmia. With either ACTH or cortisone, the latter effective locally, the manifestations of acute inflammation subside, in many cases in a few days, and the sequelas of corneal scarring in the one, and the multifarious complications of the other, are mitigated or even completely averted. In the case of endocular inflammations, iridocyclitis, choroiditis, and the like, there is a general agreement that these drugs, best administered systemically in choroiditis, are particularly effective in those cases in which gross exudative changes are a feature. A severe attack of acute choroiditis may subside within a few days, leaving an eye often functionally unimpaired by its experience, a recovery which, at least on a short-term basis, is well sustained. Similar results have been reported in a variety of external diseases, particularly those like episcleritis and phlyctenular disease, which are allergic in nature.

The short-term cure by cortisone or ACTH of those ocular diseases which have a known tendency to recurrence should never be allowed to distract attention from the

search for etiologic factors. The period of follow-up of all the reported cases is short; some acute cases have relapsed and responded less well to subsequent treatment, while in the more chronic cases, if indeed they improve at all, relapse is only too common once the protective curtain is withdrawn. At present in regard to these diseases it is perhaps permissible only to hope that the abortion of an acute attack, of iridocyclitis for example, within a day or two may leave the eye less liable to the subsequent attacks, formerly so prone to occur, however thorough the investigation and drastic the treatment.

A Glance at Modern Treatment in Ophthalmology (Coup d'oeil surlla therapeutique oculaire moderne). J. LACERTE. Canada. Laval méd. *16*:632-41, May 1951.

Among the sulfonamides, sodium sulfacetamide 30 per cent has been found most useful for local treatment. It can be instilled, used in a pack, or given by ionization. Allergy is not common, and adsorption is good.

Antibiotics have several advantages over sulfonamides: antibiotics are usually less toxic; they are not inhibited by conjunctival secretions; harmful effects on the corneal epithelium are less; and they are effective against a wider range of organisms. Penicillin can be given locally by several methods, and systematically. Excellent results have been obtained with penicillin in the treatment of specific, interstitial keratitis. Streptomycin retards the growth of corneal epithelium. It can be given best, locally, by ionization. Aureomycin has been found effective against herpes corneae. For each patient a gram stain of the conjunctiva secretions is made. If gram positive organisms are found, penicillin is used, if gram negative organisms are presented, streptomycin is employed.

Lacerte has had little experience with cortisone or ACTH. The action of intravenous typhoid vaccine is similar.

Lamellar corneal grafts have been found useful, particularly in cases of herpes corneae and interstitial keratitis. Roentgen therapy has also been used in cases of herpetic keratitis. 19 references.

HYGIENE, PROPHYLAXIS, OCCUPATIONAL OPHTHALMOLOGY AND INJURIES

Industrial Visual Screening. W. T. CAMERON. Southbridge, Mass. Am. J. Optom. & Arch. Am. Acad. Optom. *28*:309-16, June 1951.

In this report, the author describes the evolution and application of modern industrial vision programs. The groups interested in industrial visual care are classified and discussed.

The author carefully analyzes the various systems of industrial vision screening programs and their main guiding principles.

The primary importance of corrective visual care is emphasized as distinct from the job visual standards. The reason professional direction of visual screening programs is needed is covered in detail by the author.

The important steps in a practical industrial vision screening program are described. Specific points to watch in the installation and administration of a program are presented.—*Author's abstract.*

Emergency Treatment of Eye Injuries. R. G. C. KELLY. Canada. Modern Medicine of Canada *6*:21-24, March 1951.

Foreign bodies in the cornea form 58 per cent of eye injuries. A history of how the foreign body got into the eye should be obtained. For removal good anesthesia, a comfortable position, good illumination, and sterile instruments are essential. Rust should be removed. Mercury bichloride 1/3000 and 30 per cent sodium sulfacetamide ointment are instilled after the body is removed, and the eye is tightly bandaged. Never patch a pussy eye. Don't use atropine routinely. Certain foreign bodies are well tolerated in the corneal stroma and should be left alone.

Corneal abrasions can easily be missed. Stain with fluorescein when there is any doubt. Treat them by instilling mercury bichloride salve and covering the eye with a tight pad. Abrasions from babies' fingernails are particularly distressing. They are found by staining with fluorescein, treated by painting with 7 per cent iodine, instilling 1 per cent atropine ointment, and covering the eye with a patch.

Welders flash is bilateral. The eye reaction varies as the length of time of the exposure and inversely as the square of the distance from the source. Under the slit lamp the corneal epithelium will be seen to be edematous. Make the eye comfortable with anesthetic. In 12-18 hours the eyes should be all right.

Burns may be thermal or chemical. For thermal burns remove foreign material and use antiseptic ointments. Burns from acid are not so bad as those from alkali. For the former, irrigate, apply a smooth ointment, and cover the eye with a patch. For the latter, which are progressive burns, irrigate with boric acid, remove foreign material, such as plaster, from the fornices, instill atropine, wash with 10 per cet neutral ammonium tartrate, and apply an ointment containing a chemotherapeutic agent. The patient should return regularly for treatment to prevent adhesions.

Lacerations of the conjunctiva may be larger than one realizes on simple inspection. Suture them with black silk.

Contusions of the orbit and eyeball cause a variety of conditions. If there is blood in the anterior chamber, the patient should be put to bed and seen regularly. Use atropine only if the eye reddens, pilocarpine only if increased tension supervenes. Hemorrhages and injuries to the posterior part of the globe are usually serious and should be treated with rest in bed, as indicated.

An injury sufficient to rupture the globe usually causes extensive damage. Prolapsed iris should be excised and the wound closed with sutures or covered with a conjunctival flap. Penetrating wounds, if unaccompanied by a retained foreign body, are sutured; whatever is in the wound should be excised. The danger of infection is great, and penicillin and foreign protein injections should be given. The history usually suggests the possibility of a retained foreign body. If the foreign body is apparent, it can be removed at once. If it is not visible, localize it accurately before attempting removal. Now that antibiotic therapy is available careful localization is more important than speedy removal of the foreign body.

ILLUMINATION AND ILLUMINATING ENGINEERING

Practical Lighting. BRUCE JENSEN. Trenton, N. J. Am. J. Optom. & Arch. Am. Acad. Optom. 25:429-34, Aug. 1951.

Practical lighting at customer level is applied today generally by personnel of utility companies, lamp companies, jobbers, distributors, etc., with the welfare of the worker in mind, through improved vision, increased production, and general well-being.

The practical lighting engineer approaches the analyzation of a seeing task with the three elements required for sight in mind: light, the object to be seen, and the eye. Also considered are the major factors for seeing: time, size, brightness, and contrast. The lighting engineer, working with the customer directly, must give cognizance also to direct glare, reflected glare, shadows, and surrounding.

The equipment used largely today in industry is the RLM reflector, installed in various patterns above the work, to produce the desired illumination. For high intensity-lighting, at work points, great use is made of local lights to deliver 200 to 300 foot candles at the point needed.

Constant attention is given to quality of light, which includes up-light to improve the surroundings and reduce contrast. In addition to quality, quantity of light necessary for the task to be performed is considered vital.—*Author's abstract.*

OPHTHALMIC SOCIOLOGY

Why and How We Help Parents to Train Blind Babies. LILLIAN RAY TITCOMB. Los Angeles, Calif. Medical Woman's Journal 58:20-25, Jan.-Feb. 1951.

The Nursery School for Visually Handicapped Children was founded in Los Angeles, in 1938, by the local Delta Gamma alumnae. It is their contribution toward their national project—Aid to the Blind and Sight Conservation. These women discovered that the early training and education of the preschool blind child was practically nonexistent.

The first reaction of parents to the fact that their child is blind is one of despair, too often resulting either in neglect or overpampering and pathetically spoiling the child.

During 13 years of experience with blind babies and their families, a unique parent guidance program has been evolved by the Nursery School, which serves as a practical demonstrating workshop. Parents bring their child to the school when he or she is 6 or 7 months old, or as soon as they learn that it has impaired vision. Uplift and a challenge are spontaneous as soon as they observe the activities of the well adjusted children.

The parent guidance program is composed of three groups: the cradle club, the day pupils, and the resident pupils.

The cradle club-parents report from time to time with their child. The competent teaching staff, in addition to the fine professional staff (who donate their services),

make observations and suggestions. The parents are helped to arouse the child's interest in his surroundings and warned against the formation of undesirable mannerisms so often acquired by blind children. Visits become longer as he progresses, and when he reaches the 3 year old level, he may spend from one to four days a week as a day pupil. When he reaches the 4 year old level he may enter the Nursery School as a resident pupil, living there only four nights and five days of each week. The parents keep in close contact with the school and individual counselling is given willingly.

The program of the school covers a wide field of training and instruction of the blind child from the early muscular development and coordination, self-feeding, bathroom hygiene, and speech development, through babyhood, nursery school, and kindergarten to an easy adjustment in the first grade of public school. Having spent weekends at home with his family, who take pride in his achievement, he has become adjusted socially in his own community.

The new well equipped building with its delightful play yard complete with apparatus, including a wading pool and specially designed swimming pool, the gift of Esther Williams, furnishes ample opportunity for all-round normal development and experiences.

However, it is the sincere efforts of the carefully chosen staff of superior women—women with patience, mothercraft, superior character and personality—stimulating enthusiastic cooperation from the parents, that, all in all, bring about the outstanding accomplishments of the Nursery School for Visually Handicapped Children in behalf of these little blind people.

MISCELLANEOUS

The State of Illinois Cooperates With the Ophthalmologist and Otolaryngologist. HERBERT R. KOBES, Springfield, Ill. Ill. M. J. 99:303-307, June 1951.

The otolaryngologists and ophthalmologists deal with many children who, because of a variety of disabilities, need the skills of many types of workers. Collaboration, integration, and teamwork is emphasized more and more in the fact that physicians ally with themselves different types of technicians.

The state of Illinois has set up specific programs which are of considerable assistance to the physician and his patient. Among these is the Division of Services for Crippled Children of the University of Illinois, which conducts a medical care program for children with many types of handicapping conditions, including services to the deaf and hard of hearing. Specialist services are available in the Division clinics held throughout the state where recommendations for office treatments, hospital care for surgery, hearing aids, school seating placements, and lip reading instruction may be made. Thus this statewide medical care program is able to offer services to children who might not otherwise get excellent care because services were not readily available due either to the economic handicap of the parents, or lack of resources in or near the place of the child's residence. Private physicians, school health programs, the hospitals, the Division of Services for Crippled Children, the Department of Public Welfare through the School for the Deaf, the Division of Education for Exceptional

Children, and the Division of Vocational Rehabilitation give, through their combined resources, services which probably are not excelled anywhere.

Otologists have many opportunities to promote the development of a better hearing program in their own communities. They may become allied with programs giving teachers proper medical orientation concerning the general problem, by visiting hearing aid centers, and visiting oral deaf rooms in their community.

This review of how members of the medical profession and the community programs of the State of Illinois can work together to improve the lot of many handicapped children who are their patients will stimulate a greater awareness of all the resources that are available. Where these resources are not available and needed, physicians in their role of citizens should strive to improve the resources of their own community.—*Author's abstract.*

Military Requirements and Vision Training. ROBERT E. BANNON, Hanover, New Hampshire. Am. J. Optometry *28*:275-77. May 1951.

This editorial raises the question of the moral and professional responsibility of optometrists who are consulted by young men seeking to improve their visual acuity or their color vision so that they may pass the requirements for the Air Force, the Marine Corps, and the Navy.

Although one's ability to read the Snellen Chart or various color vision plates may be improved by training and practice, this improvement in performance must not be mistaken to mean that the degree of ametropia or of color vision blindness has been changed. In view of recent studies, which indicated that the degree of myopia was not materially affected by the vision training given and that color blindness was not significantly altered by the training given, the author concludes that optometrists will render a greater public service if they will advise myopic young men that they should not jeopordize their own lives or the lives of others by trying to squeeze by the vision requirements of the Armed Services.—*Author's abstract.*

A Factor Analysis of Vision Tests. VIRGINIA ZACHERT, San Antonio, Texas. Am. J. Optom. & Arch. Am. Acad. Optom. *25*:405-16. Aug. 1951.

In industrial situations, as well as with the work of members of the ophthalmic professions, it is important to know whether or not specific and unique traits are found with the various tests given in a battery of vision tests. The present investigation attempts to analyze the vision test scores obtained in the ortho-rater battery and to identify which of these tests contain group factors and which have specific factors.

An additional problem was using the scoring keys for the phoria tests, as they could not be used in their present form for intercorrelations. Utilizing a newly developed key, the number of tests in the battery was increased to 16 instead of the original 12 by the addition of four tests of phoria.

The intercorrelations were based on two thousand sets of test scores procured from the files of the Occupational Research Center of Purdue University. This matrix was factor-analyzed and five group factors identified. These factors were called: acuity, esophoria, right hyperphoria, left hyperphoria, and exophoria.—*Author's abstract.*

Visual Correction and School Achievement. NEWELL C. KEPHART. Lafayette, Ind. Am. J. Optom. & Arch. Am. Acad. Optom. 25:421-23, Aug. 1951.

Two groups of boys resident in the Colorado Industrial School for Boys were studied. All subjects in both groups were in need of eye care as indicated by the ortho-rater battery of visual skill tests. The two groups were matched in I. Q. and educational achievement at the beginning of the study. One group was given eye care (corrective lenses) and the other was not. At the end of the experimental period (four months later) the group which had received visual correction had gained significantly more in educational achievement than had the group which received no visual correction. It is concluded that the correction of visual difficulties leads to more rapid progress in school achievement.—*Author's abstract.*

ANNOUNCEMENTS

Eye, Ear, Nose and Throat Specialists Elect Officers

Dr. Frederick C. Cordes, San Francisco, was named president-elect of the American Academy of Ophthalmology and Otolaryngology, October 18 at the annual session in the Palmer House, Chicago. Three vice presidents were also elected: Drs. Georgiana Dvorak-Theobald, of Oak Park, Illinois; Percy E. Ireland, Toronto, Canada, and John S. McGavic, of Bryn Mawr, Pennsylvania. Dr. William L. Benedict, Rochester, Minnesota, was reelected Executive Secretary-Treasurer. Presidents of the Academy are elected a year in advance and take office on January 1 following the annual meeting. The incoming president will be Dr. James Milton Robb, Detroit, who assumes the office on January 1, 1952; Dr. Cordes becomes president on January 1, 1953.

The Academy has in addition a board of secretaries, all of whom were reelected. These are Drs. Kenneth L. Roper, Chicago, secretary for ophthalmology; Howard P. House, Los Angeles, secretary for otolaryngology; Albert D. Ruedemann, Detroit, secretary for instruction in ophthalmology; Dean M. Lierle, Iowa City, Iowa, secretary for instruction in otolaryngology and maxillofacial surgery; Lawrence D. Boies, Minneapolis, and Erling W. Hansen, Minneapolis, secretary for public relations. Dr. Francis R. LeJeune, New Orleans, was elected a member of the Academy Council.

Dr. Cordes is clinical professor and chairman of the division of ophthalmology at the University of California Medical School and a former chairman of the American Board of Ophthalmology. He is civilian consultant in ophthalmology to the Surgeons General of the U. S. Army and of the Navy and is consultant to the California State Board of Health, the National Society for the Prevention of Blindness, and the Southern Pacific Railroad. He is also associate chief examiner of the National Board of Medical Examiners, a director of the Heed Foundation, and a director of the Francis I. Proctor Foundation for Ophthalmic Research at the University of California.

Dr. Cordes has been active in many organizations within his specialized field, having served as president of the Association for Research in Ophthalmology and the Pacific Coast Oto-Ophthalmological Society; vice president of the Pan American Congress of Ophthalmology; chairman of the section on ophthalmology of the American Medical Association; chairman of the council of the American Ophthalmological Society, and member of the subcommittee on ophthalmology of the National Research Council.

Besides these activities, Dr. Cordes is associate editor of the American Journal of Ophthalmology and a former member of the editorial board of the Archives of Ophthalmology and a member of the editorial board of California Medicine.

Plan International Congress of Eye Specialists in 1954

The seventeenth International Congress of Ophthalmology will be held in New York City in the autumn of 1954, it was announced by Dr. Bernard Samuels of New York, who will serve as president of the congress. The vice president of the congress is Dr. John H. Dunnington, New York, and the secretary-general is Dr. William L. Benedict, Rochester, Minnesota.

Four national bodies in the United States joined in the invitation to the International Council of Ophthalmology to bring the congress to this country. Committees representing the four groups were as follows:

American Ophthalmological Society: Drs. Frederick C. Cordes, San Francisco; Algernon B. Reese, New York, and Derrick T. Vail, Chicago.

Section on Ophthalmology of the American Medical Association: Drs. Dunnington, New York; Lawrence T. Post, St. Louis, and Harold H. Joy, Syracuse, New York.

Association for Research in Ophthalmology: Drs. Brittain F. Payne, New York; James H. Allen, New Orleans, and Phillips Thygeson, San Jose, California.

American Academy of Ophthalmology and Otolaryngology: Drs. Philip M. Lewis, Memphis, Tennessee; Erling W. Hansen, Minneapolis and Dr. Samuels, New York.

The invitation presented in the name of these committees was accepted by the International Council of Ophthalmology at a meeting in Paris in May 1951.

The Council, which is chosen by the Federation of Ophthalmological Societies of 62 countries, is made up of the following:

Professor J. van der Hoeve, Leiden, Holland
Professor J. W. Nordenson, Stockholm, Sweden
Dr. Conrad Berens, New York, U. S. A.
Dr. Edouard Hartmann, Paris, France
Professor Marc Amsler, Zurich, Switzerland
Professor E. Hamdi El Maziny Bey, Cairo, Egypt
Sir Stewart Duke-Elder, London, Great Britain
Mr. A. F. MacCallan, Hertford, Great Britain
Dr. F. Tooke, Montreal, Canada
Professor W. Lehlein, Berlin, Germany
Professor E. Velter, Paris, France
Professor W. Kapuscinski, Poznan, Poland
Mr. Frank W. Law, London, Great Britain
Dr. Bernard Samuels, New York, U. S. A.
Dr. M. E. Alvaro, Sao Paulo, Brazil
Professor G. Bietti, Pavia, Italy
Professor R. Arganaraz, Buenos Aires, Argentina

The first International Council of Ophthalmology was held in Brussels, Belgium, in 1857. Congresses have been held at four year intervals since that time, except for interruptions caused by wars. New York was the scene of the fifth congress in 1876, 78 years ago. The most recent one was held in London in 1950, with representatives of 62 nations in attendance.

The cumulative cross reference index for the 1951 Quarterly Reviews of Ophthalmology will be printed in the March 1952 issue.

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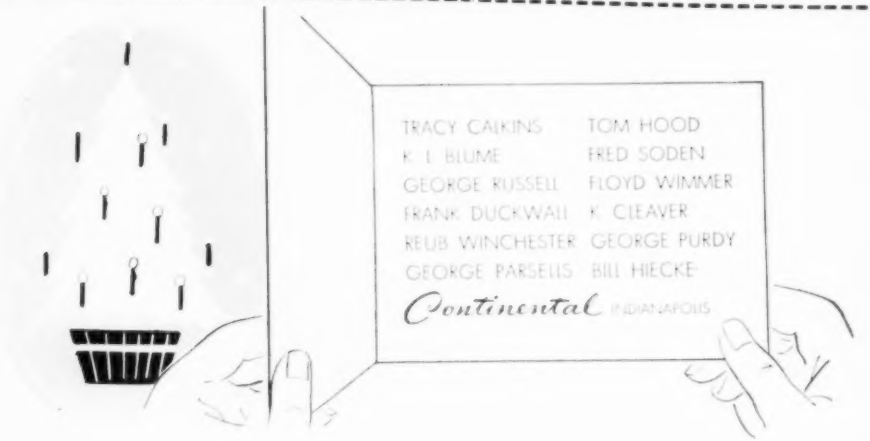
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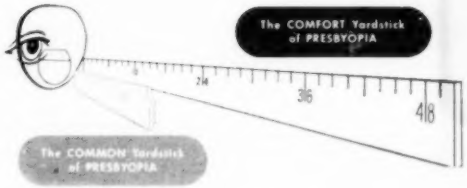

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